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FEBRUARY 5, 1887.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXI. REGULAR EDITION NO. 530.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON • MASS.

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ILLUSTRATIONS.

Reading-room Missouri Safe-deposit Co.'s Building, St. Louis, Mo.
(Gelatine Print issued only with Imperial Edition.)
House, Cambridge, Mass.
Stores on South St. Boston, Mass.
House, Albany, N. Y.
House, St. Paul, Minn.
Side Doorway of Church of San Vincente, Avila, Spain,
Cape Cod Sketches.—No. III.

STATEMENT

OF

The Mutual Life Insurance Company of New York,

RICHARD A. McCURDY, President.

For the year ending December 31st, 1886.

ASSETS.....$114,181,963.24.

Insurance and Annuity Account.

	No.	Amount.		No.	Amount.
Policies and Annuities in force, Jan. 1st, 1886	120,952	$368,981,441 36	Policies and Annuities in force, Jan. 1st, 1887	129,927	$393,809,902 88
Risks Assumed	18,673	56,832,718 92	Risks Terminated	9,698	32,004,957 40
	139,625	$425,814,160 28		139,625	$425,814,160 28

Dr. Revenue Account. *Cr.*

To Balance from last account	$99,865,644 11	By Paid to Policy-Holders:	
" Premiums	15,634,720 66	Endowments & Purchased Insurances	$4,908,729 61
" Interest and Rents	5,502,456 01	Dividends & Annuities	2,727,454 13
		Deceased Lives	5,492,920 00
			$13,129,103 74
		" Other Disbursements: Commissions and Commutations	$1,732,632 83
		Taxes	277,169 85
		Expenses	1,091,613 94
			3,101,416 59
		" Premium on Stocks and Bonds Purchased	52,506 14
		" Balance to new account	104,719,734 81
	$121,002,820 78		$121,002,820 78

Dr. Balance Sheet. *Cr.*

To Reserve for policies in force and for risks terminated	$108,460,130 25	By Bonds Secured by Mortgages on Real Estate	$50,118,049 66
" Premiums received in advance	78,274 84	" United States and other Bonds	42,071,641 00
" Surplus at four per cent	5,643,568 15	" Loans on Collaterals	6,172,917 25
		" Real Estate	10,591,226 32
		" Cash in Banks and Trust Companies at interest	2,306,223 08
		" Interest accrued	1,166,870 65
		" Premiums deferred and in transit	1,565,117 28
		" Sundries	188,978 00
	$114,181,963 24		$114,181,963 24

I have carefully examined the foregoing statement and find the same to be correct.

A. N. WATERHOUSE, *Auditor.*

From the Surplus above stated a dividend will be apportioned as usual.

NEW YORK, January 26, 1887.

BOARD OF TRUSTEES.

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXI. Copyright, 1887, TICKNOR & COMPANY, Boston, Mass. No. 580

FEBRUARY 5, 1887.

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M. RIVOALEN, in *La Semaine des Constructeurs*, calls attention to a new danger which threatens architects here, perhaps nearly as much as it does in France. It is curious that the course of the insurance business abroad has been very similar to that which it has followed here. Twenty years ago, the existing companies were doing a large business, and found themselves making great profits. It was not long before professional speculators also discovered this, and a swarm of new companies sprang up, with names, as M. Rivoalen says, "almost angelic" in the sense of security which they conveyed, and long lists of distinguished directors, ready to compete with the older corporations for the business and the profits. To introduce themselves, the new-comers wrote policies on anything and everything, receiving their premiums with the sweetest smiles, and paying generously for small partial losses. By these means they drew clients from the strong companies, who, to meet the competition, were obliged to make concessions, and incur risks, which gradually devoured the profits of their business, leaving them struggling from year to year for bare existence. The speculative companies, who went far beyond their older rivals in tempting fortune, would soon have succumbed, but for a novel feature which they introduced into their operations. Previously it had been customary, on satisfactory proof of loss, to pay the policy-holder his claim in full; but the new men, on being presented with notice of the total destruction of property which they had insured, lost their suave demeanor, denied and defied the claims of the policy-holder, finally consenting to pay a third or a fourth of the loss, but protesting that they would exhaust their whole capital, and the lives of all the parties concerned, in litigation, before they would pay another penny. The timid policy-holders, scared by these violent expressions, which are only too familiar here, usually compromised their claims, and the business of the new companies flourished, to the satisfaction of the speculators, if not of the stockholders, for a good many years. At last some of their policy-holders, less tractable than the rest, undertook to enforce their contracts of indemnity in full, by legal means, and succeeded; and this emboldened the rest, so that compromising became more difficult, and as their funds began to be drawn out more freely, the upstart companies fell ill, and died, one after another. Within a year or two, many of them have been swept away, and in France, as here, the old and strong companies, relieved of their unscrupulous competition, have become more careful about the risks which they take, and more particular in establishing rates to correspond with the real hazard. Besides this, they have taken to examining the effects of fire on various sorts of construction, and to noticing the defects which give occasion most frequently to conflagrations; and M. Rivoalen points out that it will not be long befere they find out the dangers of those faults which careful architects endeavor to avoid, and nothing is more likely than that they may give considerable trouble to careless architects, who should have avoided the conditions which may have led to a fire, but neglected to do so. It must be remembered that an insurance company which pays a loss, acquires all the rights which the policy-holder would have, in collecting indemnity or damages from persons whose fault or negligence caused that loss, and, while a private owner would not usually think it worth while to inquire by whose carelessness a steam-pipe was allowed to come in contact with wood, or a smoke-pipe to be placed too near the ceiling, the officers of an insurance company would have no such reluctance, but would think it only their duty to their stockholders to pursue the person at fault to the uttermost. It is true that for the present it is no part of the architect's duty, unless his client wishes it, to depart from the usual system of construction in favor of one more secure against fire: and he cannot be blamed, still less held responsible, because the cheap roof, or the wooden furrings, which the exigencies of the case, including that of economy, required, proved less incombustible than the underwriters would have liked, but there are certain details, especially in city buildings, in which the law, not his client, gives him the directions that he must obey, and he can unquestionably be held responsible, to the extent of his property, for losses plainly due to his neglect of these directions. How enormous the losses may be for which he would be called upon to pay, we, in this easy-going country, hardly understand, but it is usual in France, if a fire spreads beyond the place where it originated, for all the neighbors injured by it to demand satisfaction from the original sufferer, and his policy generally expressly insures him against these claims; and it has been repeatedly decided in this country, we believe, that the person responsible for the first fire is liable, also, for the damage to all buildings or property to which fire may have been communicated from the first building.

THOSE architects who have had much to do with party-walls know that there are some inconveniences as well advantages, connected with the system of allowing one wall to serve for two owners. The inconveniences of the system are perhaps usually most conspicuously exhibited when one owner wishes to improve his property, and build upon the party-wall, which he is very apt to find in a condition quite satisfactory to his neighbor, but entirely unsuitable for his own purposes; and the opposing interests of the proprietor who wishes to pull it down and rebuild, and the one who prefers to leave it untouched, or, at least, not to pay anything toward the cost of reconstruction, often lead to serious quarrels. It is notorious that juries, when these quarrels are brought into court, usually incline toward the side of the party who objects to having the existing state of things disturbed; but the most extraordinary case of the kind that we have yet met with was decided without a jury in a French court. According to M. Collet-Corbiniére's report in *La Semaine des Constructeurs*, a certain M. Meunier owned a vacant lot in Paris, adjoining a house belonging to Mme. André, the wall of which stood on the party-line. M. Meunier wished to build on his lot, using the party-wall, but was deterred from doing so by observing that the wall leaned in a manner which, to use the mildest expression, should be termed frightful. He sent an expert to examine the work, who reported that he found the masonry in so bad a condition that he had not dared to test the joints, or to detach any of the plastering, for fear of bringing the whole down about his ears, but he had ascertained that the top of the wall overhung the base nearly five feet. Luckily for Mme. André, it had chosen to lean toward her side of the line rather than the other, and to use the expert's expression, it was reposing on the floors and partitions of her house, instead of holding them up, and had already pushed the building over onto the next owner's land. Under these circumstances, the expert thought that the wall had lost its quality as a proper party-wall, and that, under the law, it might be pulled down by M. Meuniér, and rebuilt at the joint expense of the two proprietors, and it was torn down and rebuilt accordingly. Mme. André's share of the bill amounted to thirty-two hundred dollars, which she absolutely refused to pay. On being sued for the amount, the counsel argued that the old wall was quite suitable for a party-wall, and need not have been pulled down; and, on being asked whether a wall which leaned fifty-five inches from the vertical, in a height of eighty-five feet, could be considered in good condition, coolly replied that this appeared to have been the result of design on the part of the original builders, and not of any weakness of the masonry. The expert, in opposition to this original

explanation, showed that the custom of Paris, which was the common law governing such cases at the time the house was built, before it was superseded by the Code Napoléon, expressly provided that any party-wall which, either accidentally or intentionally, leaned so much that the top overhung the base by a distance greater than half the thickness of the wall, should be considered as unfit for the purposes of a party-wall, and might be torn down and rebuilt by either owner at the joint expense. Notwithstanding these representations, the tribunal of first instance decided that Mme. André's wall was good enough for her purposes, and that she ought not to pay anything for having it rebuilt. The case was immediately appealed, and it seems likely that the higher court will reverse the decision; but it is worth remembering, in any case, that so authoritative a code as the Custom of Paris should have placed the limit between a serviceable and an unserviceable wall at the point where the variation from the vertical exceeded one-half the thickness of the wall.

FIRE AND WATER makes a suggestion which, in a somewhat amended form, would be an excellent one. It has just learned the fact, which has been known to architects and brick masons for about two hundred years, that in houses where wood is used for fuel, the "pyroligneous," or, as we should rather say, the crude acetic acid in the smoke, which is a very rapid solvent of lime, attacks the mortar in the joints of the brick chimneys, eating it away until it falls out, leaving an opening through which sparks escape, frequently setting fire to the woodwork near, and destroying the building. Moved by this discovery, with characteristic energy, it consulted a "building expert," who explained that "all the trouble would be done away with" by using terra-cotta chimney-caps above the roof, and carrying up round sheet-iron smoke-pipes from the various stoves and fireplaces, through the brick flues, to the top. The expert went on to say, what is undoubtedly true, that the circular iron pipe would carry off smoke better than the brick flue, and that the surrounding air-space might be used for ventilation, or for conducting air, heated by contact with the iron pipe, to the upper rooms; but he neglected to mention that, as pyroligneous acid has nearly as much fondness for sheet-iron as for lime, the pipe would be eaten away by the smoke in two or three years, and would fall in pieces down the flue, choking it up and giving infinite trouble, while the pyroligneous acid, with appetite only sharpened by the trifling postponement of its repast, was devouring the mortar joints, now fully exposed to its influence, and probably all the more vulnerable from having been laid with the idea that the iron pipe would protect them. With the substitution, however, of fire-clay pipe for iron, the objections to *Fire and Water's* plan disappear, and it deserves to be recommended to all builders and house-owners. Such pipe, which is, as *Fire and Water* will probably be surprised to learn, very extensively used for the purpose to which it proposes to apply it, is unaffected by anything contained either in coal or wood smoke, and, if properly made and set in place, will last as long as the brick flue in which it is set; while it conducts smoke rapidly and easily, is readily cleaned, without fear of endangering the house by the dragging of loose mortar out of the joints, which so often follows the sweeping of a brick flue, and if well put up, permits the use of the vacant parts of the chimney in which it is placed for ventilation or for the conveyance of hot air.

A CURIOUS little trick has been frequently practised of late in Paris, to the detriment of the lime manufacturers of the suburban region, who have taken steps to call the attention of the Government to their grievance. Every one knows that the splendid works of Paris, as of many other continental cities, are in great part paid for out of the proceeds of the *octroi*, or duty upon provisions, building materials and certain other necessaries of life, which is collected with rather annoying thoroughness at all the gates and railway stations. The *octroi* duty on lime for building purposes is two dollars and forty cents a ton, and as lime is used in the city in enormous quantities, the duty upon it not only brings a very substantial sum into the city treasury, but forms an important item in the expenses of contractors, who have naturally exercised their wits a good deal to find some way of relieving themselves of a part of the burden. As it happens, the French lime used in Paris is usually employed in a powdered state, something as the New York masons use ground lime for mortar. Whether the French lime, like that used in New York, is slightly hydraulic, so that it will not slake well unless pulverized, we do not know, but it seems not improbable. However that may be, the lime-burners, in order to powder their product for the market as cheaply as possible, sprinkle water on the lumps as they come from the kiln, to the amount of one-third of their weight, partially slaking them, but making their reduction to the desired condition much easier. Mixed, in this way, with water, the lime is sent to Paris, and pays duty on its weight in this semi-hydrated condition. Certain ingenious dealers, however, observing that the tariff makes no distinction between hydrated and non-hydrated lime, have recently procured from quarries in Belgium a cheap quick lime, resembling our Eastern lump lime, which can be slaked at any time. This lime is brought in lumps to the canal basin of La Villette, and then pays duty by weight, just as the French lime does. Once past the *octroi*, the dealer adds thirty-three per cent of water from the canal to his boat-load of lime, and makes four tons of marketable powder out of his three tons of dutiable lime. But this is not all. Without unloading his boat, he proceeds through the canal to the exit basin of Aubervilliers, where he obtains a drawback certificate, setting forth the weight of his watered cargo, and authorizing him to import, free of duty, a quantity of lime equal to that which he has exported. It is obvious that a cargo which increases by one-third every time it passes through a short canal must be a profitable one. Supposing only six trips a week to be made with one small canal boat, the *octroi* paid at the start on a cargo of three hundred tons, would at the end of the first week, have been stretched to cover nearly seventeen hundred tons, at a saving to the owner, and a loss to the revenue, of considerably over three thousand dollars, and, with a certificate entitling him to import free of duty seventeen hundred tons more, to begin the next week's business with, the boat-owner's profit would, as any one fond of arithmetic can ascertain, soon reach gigantic proportions. If the Belgian lime were equal to the French, the public officials might, perhaps, look with complacency upon the geometrical progression which was taking place in the denominator of the fraction which represented the ratio of the actual to the nominal duties which they collected upon it, but it is said to be inferior, and, according to *La Semaine des Constructeurs*, a strong argument is made against its introduction on this ground.

WE do not very often have occasion to speak particularly of the illustrations which appear in our technical exchanges, but we ought not to pass silently by the appearance of such beautiful sketches as the two which are to be found in *La Semaine des Constructeurs* for December 25. The two sketches show portions of the same building, the new Hôtel de Ville, at Neuilly, but they are by different hands, one, showing a corner pavilion of the façade with its great dormer window and a part of the beautiful cornice which runs around the building, being by M. Noé, whose admirable style is here shown at its best, while the other, giving a fragment of the same cornice is by M. Rivoalen, and is perhaps the prettiest bit of pen-and-ink detail sketching that we remember, not even excepting M. Raguenet's effective work. We have always admired greatly Mr. Raffles Davison's soft, but forcible drawing, but Mr. Davison's forte does not, perhaps, lie in figure-drawing, and he could hardly have done full justice to Barrias's round, luscious sculpture, which M. Rivoalen has rendered with perfect success. Pen-and-ink sketching, as we have sometimes observed, is a thing which few French architects attempt; but Frenchmen usually contrive to do well whatever they undertake, and if there is any architect who thinks he can make a better sketch of detail than M. Rivoalen, we hope he will communicate with us immediately.

IN the same number of *La Semaine* we find notes of a number of important changes in the Ecole des Beaux-Arts, which will interest many of our readers. First among these comes the appointment of M. Monduit, to succeeded the late M. Brune, as professor of construction, M. Chevillard, the professor of perspective, is replaced by M. Julien; and M. Hiolle, the professor of modelling, is succeeded by M. Delaplanche. Several professors have had substitutes appointed for the year, as, for instance, M. Henzey, whose courses in archæology will be given by M. Homolle, one of the most distinguished archæologists of the day; and M. A. Lenoir, professor of the history of architecture, whose classes will be taken by M. Boitte.

EARLY SETTLER MEMORIALS.[1] — VI.

MEMORIALS AT CONCORD, MASS. — THE OLD MONUMENT.

Old Monument, Concord, Mass.

THE first corner-stone of this monument was laid in 1823, in the square in the centre of the town, but for lack of funds nothing more was done until 1836, when the present structure was built on land given by Rev. Dr. Ripley. During this interim, the boys of the town utilized the corner-stone as the beginning of a monument which they erected in the space of one night. They covered the ground intended for the base of the monument, that was unoccupied by the corner-stone, with three large empty sugar-boxes. Upon these they erected four hogsheads, then four barrels, four half-barrels, four nail-kegs, and four snuff-kegs. On these they placed one hogshead, then a barrel, a half-barrel, a nail-keg, and a snuff-keg, and surmounted all with a two-gallon jug.

To assist those who wished to view from such a lofty height the historical surroundings, these zealous youths borrowed, tradition says "stole," a pair of stairs from a neighboring store, and placed them against the patriotic pile. They also contributed an appropriate inscription. But neither time nor fate smiled upon this enterprise, for the fire consumed it one fine morning as well as destroyed the corner-stone.

The present monument was designed by Solomon Willard, the architect of the Bunker Hill Monument. It is built of granite, and paid for by State aid, private and public subscription. Its height is about eighteen feet. The inscription, cut on a marble slab placed on the side of the die, is as follows:

HERE
ON THE 19TH OF APRIL
1775
WAS MADE
THE FIRST FORCIBLE RESISTANCE
TO BRITISH AGGRESSION
ON THE OPPOSITE BANK
STOOD THE AMERICAN MILITIA
HERE STOOD THE INVADING ARMY
AND ON THIS SPOT
THE FIRST OF THE ENEMY FELL
IN THE WAR OF THAT REVOLUTION
WHICH GAVE
INDEPENDENCE
IN THESE UNITED STATES
IN GRATITUDE TO GOD
AND
IN THE LOVE OF FREEDOM
THIS MONUMENT WAS ERECTED
A. D. 1836.

THE MINUTE-MAN MONUMENT.

This monument was dedicated on the 19th of April, 1875, on the occasion of the centennial celebration of the Concord fight. The statue was made by Mr. D. C. French, a sculptor of Concord. In an article on "Civic Monuments in New England," published in the *American Architect*, in 1881, we wrote as follows, concerning this statue: "No statue of a soldier that we remember in this country suggests so much of a soldier's readiness, duty and purpose as that of the Minute-Man, at Concord. This Colonial plow-boy springs to the call of a sudden occasion. The young sculptor who made it was also ready to meet the emergency of getting his work ready for a memorable ceremony. Both lacked the training of venerable warriors in their arts, but were equal to the spirit of the moment. It is this seizure of the spirit of the subject, combined with a sense of sculpture, that has made a general feeling of satisfaction towards this statue.

"The tendency of the composition of the Minute-Man is true; it is intended to mean something definite; it has a positive aim in seeking to illustrate a thrilling fact. The statue will retain its interest because of this merit, and also because of its suggestion of possibilities in the future efforts of the sculptor. The maturity of its character as a composition, and the sincerity of its execution, would make grand work. It was modelled before the sculptor was twenty-five years of age.

"Before this statue, as before those of Milmore, considering the favorable opportunities surrounding these sculptors, one involuntarily asks why they did not take more time, and do their work much better? Is it the fault of the sculptors, or of the public, that a statue should be made for erection on a certain day, month or year, when it ought to be known and understood that the best work that the sculptor can possibly do with ample time for study is really the only object to be seriously considered? We admire the Minute-Man, and the sailor on the Army and Navy Monument, not so much for what they are as for what they might have been. We should have admired them if they had been made of stuffed clothes, because there is an individuality in their composition worthy of the most serious and intelligent study. It is not necessary that an art idea in sculpture should be cast in bronze, or cut in stone to prove or demonstrate its place in art. What was there to prevent French studying several years in Paris among the only sculptors of the world, and then making his Minute-Man? The same question may be asked of Milmore. Both of them could then have made grand things. It is a possibility confirmed by too many evidences, that the average committee-man is not too susceptible of the importance of good sculpture, but is overtenacious of his own notions. It is both possible and certain that there is some responsibility resting upon the artist. That the Minute-Man should be erected on the 19th of April, 1875, was a frivolous necessity in comparison with that of the sculptor's making — what he was well able to do, by taking more time — a thoroughly fine statue, one fit for a century, instead of a date. The existence of a work of art is the appeal to posterity; the circumstances attending its production or erection are soon forgotten. The time ought to come when the sculptor will insist upon the fullest convenience for the execution

of his productions, and committees upon contributing a well-considered work of art to history rather than to the interest of a ceremony."

The form of the pedestal is very bad. It shows neither art, good taste nor good stone-cutting. Either of several of the memorial stones would have been much better. It has, however, two merits, it is not too high, and the inscription is put on in the right place. It is inscribed as follows: —

"By the rude bridge that arched the flood,
Their flag to April's breeze unfurled,
Here once the embattled farmers stood,
And fired the shot heard round the world."

The precise cost of this memorial is not known. Mr. French made his model, and left it to the town to pay him what it saw fit. The bronze was made from ten cannon granted by Congress.

THE MEMORIAL STONES.

The citizens of Concord, Massachusetts, decided that the commemorative purpose of the two hundred and fiftieth anniversary of the incorporation of the town, could best be carried out by the erection of tablets in localities connected with the leading events in its Colonial and Revolutionary history. The celebration of the anniversary

[1] Continued from No. 575, page 5.

was purely a local one — a home-coming of Concordians — no organization outside of the town was invited to take part. An address was delivered by Judge Hoar, of Concord.

In order to raise the money to defray the expenses of the occasion, legislative consent was necessary, and was obtained by a resolve of the General Court authorizing the town to raise for the purpose the sum of one-tenth of one per cent of its valuation by taxation.

Seven tablets were accordingly erected. The first was placed on the Simon Willard farm. The old farm buildings on the Willard estate were occupied during a portion of the Revolution by Harvard College. The farm-house, burned down a number of years ago, had the dimensions and dignity of an old château. In the stone wall of the farm a handsome boulder has been set, into the face of which is sunk a panel bearing the following inscription:

On this Farm Dwelt
Simon Willard,
One of the Founders of Concord,
Who did Good Service for
Town and Colony
For More than Forty Years.

At Merriam's Corner the retreating British Regulars were attacked in force by the minute-men of Middlesex, and a sharp skirmish occurred. Here a boulder has been set bearing this inscription:

MERRIAM'S CORNER.

The British Troop
Retreating from the
Old North Bridge
Were here attacked in Flank
By the Men of Concord
And Neighboring Towns
And Driven Under a Hot Fire
To Charlestown.

Stone Altar at Cledere.

On the face of Egg Rock, the base of which is washed by the Sudbury River, a panel has been sunk, inscribed as follows:

ON THE HILL NASHAWTUCK
AT THE MEETING OF THE RIVERS
AND ALONG THE BANKS
LIVED THE INDIAN OWNERS OF
MUSKETAQUID
BEFORE THE WHITE MEN CAME

On the Hill Nashawtuck
At the Meeting of the Rivers
And along the Banks
Lived the Indian owners of
Musketaquid
Before the White Men Came.

The site of the old town-house is marked by a tablet, stating that:

Near this Spot Stood
The First Town House
Used for
Town Meetings
And the County Courts
1721–1794.

On the hill where the Americans formed on the 19th of April, 1775, a slab is set in the stone-wall, with this inscription:

On this Field
The Minute-Men and Militia
Formed Before Marching
Down to the
Fight at the Bridge.

The site of Rev. Peter Bulkeley's house is marked by a bronze tablet inscribed:

Here in the House of the
Rev. Peter Bulkeley First Minister
and one of the
Founders of this Town
a Bargain was made with the
Squaw Sachem and Sagamore
Tahattawan
and other Indians
who then Sold their Right in
the Six Mile Square called Concord
to the English Planters
and gave them Peaceful Possession
of the Land
A. D. 1635.

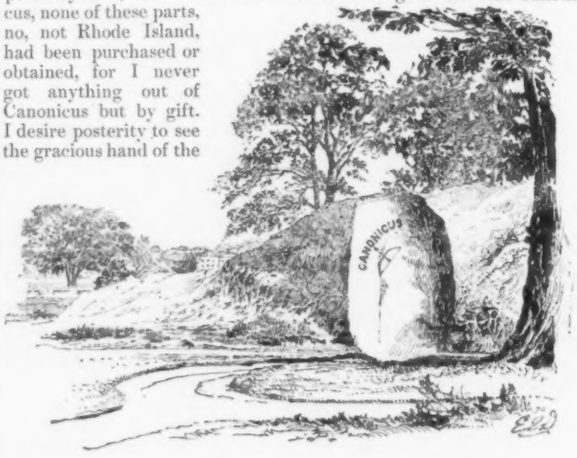
The old Hill Burying-ground is marked by a slate slab set into the wall, upon which is cut this inscription:

On this Hill the Settlers of Concord
Built their Meeting House
Near which They were Buried.
On the Southern Slope of the Road
were their Dwellings
During the First Winter.
Below it they Laid Out
Their First Road and on the Summit
stood the Liberty Pole of the
Revolution.

The good taste, in its widest sense, manifested by the committee who had in charge the erection of these tablets, needs no commendation. It appears that there are men in an American community who can be depended upon for good judgment, modesty, and an understanding of the subject with which they are dealing, in this very important matter of memorial monuments. These tablets become almost works of art, when examined in comparison with the monstrosities that desecrate so many towns and cities of the country. The committee on the erection of the tablets were Charles H. Walcott, Edward W. Emerson, Arthur G. Fuller, John F. Hosmer, and Wm. H. Hunt. Nothing better can be said of this committee than that they fully met the nature of the occasion. The seven tablets cost about eight hundred dollars.

CANONICUS BOULDER, PROVIDENCE, RHODE ISLAND.

Roger Williams wrote, more than two centuries ago, "I declare to posterity that, were it not for the favor God gave me with Canonicus, none of these parts, no, not Rhode Island, had been purchased or obtained, for I never got anything out of Canonicus but by gift. I desire posterity to see the gracious hand of the



Most High, that when the hearts of my countrymen and friends and brethren failed me, His infinite wisdom and merits stirred up the barbarous heart of Canonicus to love me as his son to his last gasp, by which means I had not only Miantinomi, and all the lowest sachems my friends, but Ousamequin also . . . . It was not price and money that could have purchased Rhode Island, but it was obtained by love."

Later appreciators of this Indian have also declared that, "To Canonicus and Miantinomi, Rhode Island owes more than to all others. They lived, and Rhode Island exists as a State to-day." "No man, not of our own race, deserves kindlier memories than Canonicus, the brave and humane old chief of the Narragansetts, savage

though he was, and surrounded as he was by the fierce and barbaric customs of his people. With thousands of followers ready and eager to obey any command, no matter how cruel, the old warrior refrained from destroying the little band of an alien race, who came seeking an asylum away from their own people. From what we know of this old Indian king, there does not appear a grander character in our Colonial history. . . . Without the aid of Canonicus, the experiment of civil government founded on religious as well as political freedom, would have been postponed perhaps for generations."

Gravestone of Professor Agassiz, Cambridge, Mass.

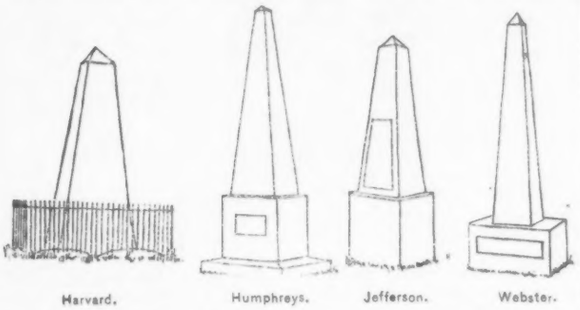
It has long been a favorite idea with some of the most earnest Rhode Island historical writers, to erect boulder memorials to distinguished Indian sachems, who have left an impress on Rhode Island history. An incident originating in very humble circumstances was the commencement of the realization of this idea. Some workmen in excavating for a sewer in Providence, brought to the surface a symmetrically-shaped boulder of primitive granite, which, before civilization had filled up the land, had evidently stood upon the bank of the stream. This stone falling under the observation of the Rev. Frederic Denison seemed to him especially adapted to memorial purposes, and, through his efforts mainly, and under the auspices of the Rhode Island Historical Society, it was placed in its present position as a memorial to the Narragansett chieftain. It stands in "Sachem's

Gravestone of R. W. Emerson, Concord, Mass.

Pillar at Ellora, India.

Glen," in the North Burial Ground, Providence, R. I. It is about five feet high, and about two feet square, and bears upon it the name "Canonicus," with a rude bow and arrow beneath it. The bow and arrow were cut upon the stone for two reasons; first, because they were so thoroughly symbolical of an Indian, and especially of a Narragansett; and, secondly, because they were sometimes used by Canonicus when making his mark.

The boulder was dedicated September 21, 1883, with ceremonies


Harvard. Humphreys. Jefferson. Webster.

usual on such occasions. It was unveiled by a member of the Narragansett tribe. Canonicus died June 4, 1747, at over eighty years of age.

The old monument at Concord, and those of Harvard, Humphreys, Jefferson and Webster, sufficiently illustrate the first upright monuments erected in the United States. The style of the first has been carried to a certain degree of development by the addition of mouldings, while the others have simply grown in size. As we make them, they have no value as works of art, nor any defined meaning with reference to the dead. Their symbolic object is claimed to be in accord with the unpretentious characters, lives, or professions of those to whom they are erected.

Boulders, or uncut blocks of stone, have been used by almost every nation, for sacred purposes of every description from time immemorial. Whatever may be the symbolic object of their erection, they stand with equal human grace and appropriateness as memorials to the poet, the philosopher, the priest or the savage. They are the purest emblems of simplicity of all monumental forms.

The motives of their erection are as widely different as could well be imagined. That which caused the placing of the one at the grave

Menlier at Grahesson.

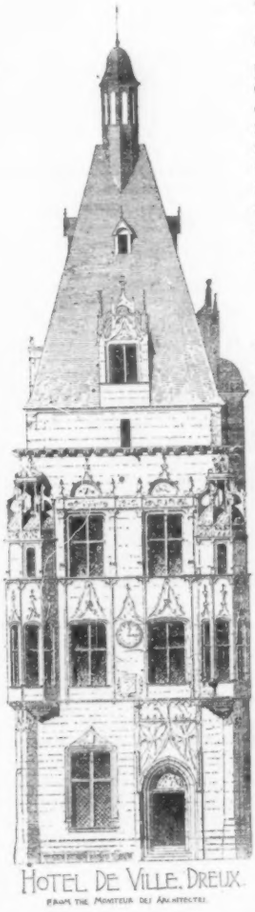
Menlier at Carnac.

of Emerson, and that which is set up to the memory of Canonicus, afford a good illustration. The first, a rock of massive beauty and variety of detailed surface; the second, a close-surfaced symmetrical boulder.

T. H. BARTLETT.

[To be continued.]

UNITED STATES GOVERNMENT BUILDING PRACTICE.—I.



IN the articles which will be published under this heading, it is proposed to show the methods, at present in vogue, of erecting Government buildings: first, the legal conditions governing the commencement and prosecution of the work; second, the specifications; third, the system used in measuring and estimating the cost of building work; and fourth, prices and data for determining the same for the various materials and labor consumed in erecting buildings.

CHAPTER I.

The Supervising Architect has charge of purchasing sites and the construction of all buildings for custom-houses, court-houses, post-offices, marine-hospitals, mints, assay offices, appraisers' stores, and barge offices; the making of plant, specifications, and estimates for these buildings, and the proper arrangement and preservation of the same, together with all reports, correspondence, etc., in relation thereto; the general superintendence of the actual construction of the buildings; and the necessary repairs to completed buildings.

An appropriation for a Government building is generally obtained from Congress by the efforts of the citizens or members of Congress in whose district the city is, for which the appropriation is made; the limit of cost is fixed, by the opinions of those interested, as to how much will be needed to erect a building of sufficient size for the officials in that place, or by the amount they can succeed in getting the appropriations committee to recommend; it is seldom that the Supervising Architect makes plans and estimates for a building which he considers sufficient for the needs of the Government in that locality, before the appropriation is made.

Exhibit of actual Cost and Construction of U. S. Government Buildings.

City and Building.	Entire Building				Facing of Walls.[1]
	No. of stories.	Cube contents.	Cost exclusive of heating, vaults, site, and app'chs.	Rate per cube foot.	
Albany, N. Y. Custom-house and Post-office	B. 3 & A.	1,404,561	$610,743.00	43.5	Granite, cut ashlar, and moulded courses
Atlanta, Ga. Custom-house and Post-office	B. & 3	686,033	265,516.00	38.1	Pressed brick,cut-granite belt-courses and trimmings
Austin, Tex Court-house and Post-office	B. & 2	409,788	175,665.13	42.9	White sandstone, rubbed and moulded
Charleston, W. Va. Court-house, Post-office, etc.	B. & 2	303,200	72,870.50	24.	Pressed brick and rubbed limestone trimmings
Chicago, Ill. Custom-house	B. & 4	6,717,048	4,323,912.20	64.7	Buena Vista sandstone, rubbed and moulded
Cincinnati, O. Custom-house and Post-office	B. 4 & A.	7,883,474	4,925,726.45	62.5	Basement, red granite; superst., gray granite, cut and moulded
Cleveland, O. Custom-house, etc., extension	B. & 3	655,122	300,000.00	45.8	Sandstone, rubbed and moulded
Covington, Ky. Court-house and Post-office	B. 3 & A.	708,298	248,724.95	35.1	Sandstone, rock-face ashlar, rubbed quoins and moulded trims.
Danville, Va. Court-house and Post-office	B. 2 & A.	249,744	85,261.00	34.1	Pressed brick and terra-cotta trimmings
Dover, Del. Post-office, etc.	B. 1 & A.	136,045	49,660.45	36.5	Basement, stone; superstructure, pressed brick and stone trims.
Evansville, Ind. Custom-house, etc.	B. 2 & A.	615,492	219,850.27	35.7	Limestone, moulded trims., rock-face ashlar and granite columns.
Fall River, Mass. Custom-house and Post-office	B. & 3	703,828	346,542.04	49.2	Gray and red granite, rock-face ashlar and cut trimmings
Frankfort, Ky. Court-house, Post-office, etc.	B. 2 & A.	337,070	97,171.28	28.8	Bedford limestone, rubbed and moulded courses
Grand Rapids, Mich. Court-house and Post-office	B. & 3	524,424	126,717.09	24.2	Pressed brick and cut-stone cornices and trimmings
Harrisburg, Pa. Post-office, etc.	B. & 3	489,720	264,361.42	54.	Granite, cut ashlar and moulded courses
Hartford, Conn. Custom-house and Post-office	B. 3 & A.	811,204	811,021.76	1.00	" " " "
Jackson, Miss. Court-house, Post-office, etc.	B. & 3	311,545	101,150.35	32.4	Pressed brick, stone and terra-cotta trimmings
Jackson, Tenn. Court-house, Post-offic, etc.	B. 2 & A.	213,700	52,711.58	24.7	" " " "
Kansas City, Mo. Custom-house and Post-office	B. & 3	796,177	354,292.16	44.5	Warrensburgh sandstone, rubbed and moulded courses
Lincoln, Neb. Custom-house and Post-office	B. 3 & A.	445,291	178,823.65	40.2	Sandstone, rock-face ashlar, rubbed quoins and trimmings
Little Rock, Ark. Custom-house, Post-office, etc.	B. & 3	494,648	215,788.75	43.6	Sandstone, rubbed and moulded courses
Memphis, Tenn. Custom-house, etc.	B. & 3	808,370	510,967.15	63.2	Basement, granite; superstructure, marble, rubbed and mol'ed
" " Marine hospital	2	443,341	38,775.00	8.7	Two brick and four frame buildings
Montgomery, Ala. Custom-house, Post-office, etc.	B. & 3	506,295	142,000.00	28.	Pressed brick, stone and terra-cotta trimmings
Nashville, Tenn. Custom-house, etc.	B. 3 & A.	1,093,491	391,867.95	35.8	Limestone, rock-face ashlar, and rubbed and moulded trims
New Orleans, La. Marine hospital	2	749,849	58,395.90	7.8	Three brick and five frame buildings
New York. Barge office	B. 2 & A.	360,707	203,334.44	56.3	Granite, rock-face ashlar and cut trimmings
Paducah, Ky. Custom-house, Post-office, etc.	B. & 3	300,202	123,471.09	41.2	Limestone, rubbed and moulded courses
Parkersburg, W. Va. Custom-house, Post-office, etc.	B. 3 & A.	585,321	219,611.32	37.5	Pressed brick, limestone cornices and trimmings
Philadelphia, Pa. Custom-house and Post-office	B. & 4	7,378,820	4,314,842.66	58.5	Granite, cut and moulded courses
Poughkeepsie, N. Y. Post-office, etc.	B. 2 & A.	281,251	63,835.13	22.7	Pressed brick, stone and terra-cotta trimmings
Raleigh, N. C. Court-house and post-office	B. 3 & A.	590,646	329,685.23	55.8	Granite, cut and moulded courses
San Francisco, Cal. Appraisers' Stores	B. & 4	2,385,000	830,837.00	34.8	Brick and stone cornices and trimmings
St. Louis, Mo. Custom-house, etc.	Sub B.B. & 4	5,854,918	5,305,299.71	90.8	Basement, red granite; superstr., gray granite, cut and moulded
Topeka, Kan. Custom-house and Post-office	B. & 3	755,560	280,314.05	37.1	Limestone, rubbed and moulded courses
Trenton, N. J. Custom-house and Post-office	B. & 3	649,140	321,075.07	49.5	Amherst sandstone, rubbed and moulded courses
Utica, N. Y. Custom-house and Post-office	B. & 3	630,246	241,618.47	38.3	Basement, granite; superstr., sandstone, rubbed and mo'ld courses
Washington. Eng. and Printing Bureau	Sub B.B. & 3	1,989,316	310,615.10	15.6	Eng. and Prtg. Bureau. Pressed brick, stone and terra-cotta trims.

As soon as a site has been selected, suitable for the purpose for which the building is intended, plans for the proposed building are made to accommodate, so far as possible, the officials in that vicinity, in accordance with reports which have been previously asked for, as to the floor-space, etc., required for the respective offices.

It is required by law that the plans and a detailed estimate, for each building, within the appropriation, shall be approved by the Secretary of the Treasury, Postmaster-General and Secretary of the Interior, before work can be begun.

In order to determine how large a building can be erected for the amount of the appropriation available after the purchase of the site and attendant expenses, and thereby save the making of many plans until one is hit upon of proper size, the first thing to determine is the character of the building, whether of stone or brick, of iron or wood construction. From experience in computing and estimating it can be told very nearly how much per cubic foot a building of a certain size and character will cost, dividing the rate per cubic foot which it is judged the building will cost into the amount of money available for its erection, will determine how many cubic feet the building is to contain, after which the general length, breadth and height of the building can be determined.

In judging of the rate per cubic foot a building should cost, it must be borne in mind that the size of the building is a material factor, a small building costing more per cubic foot than a larger one of the same character; also that Government buildings have four finished fronts, and that buildings with any of the fronts unfinished, or of cheaper construction, will, therefore, cost proportionally less.

In measuring the cubic contents of a building the actual volume is to be taken from the outside of all walls, and from the bottom of the foundations to the top of the roof, including all areas, steps and foundations, towers, dormers and chimneys; proper allowance or deduction must be made for the slope of the roof, as only the actual volume from the outside of all surfaces which enclose the building should be taken. Cornices and projecting courses are immaterial and are not considered in this measurement.

Accompanying this article is a table giving the actual cost per cubic foot, etc., of thirty-eight buildings constructed by the Government, which will be found to be a fair guide for buildings of the same character and construction. After the size of the building has been determined the plans are prepared for approval in accordance with the design determined by the Supervising Architect, which plans consist of at least two elevations and floor plans, to a small scale ($\frac{1}{8}$ inch or $\frac{1}{16}$ inch to a foot), of all the stories showing the arrangement and sizes of the rooms for the several offices. A detailed estimate is then made of the cost of each branch of work for the building, with a general specification, giving the materials, etc., of which it is to be constructed in accordance with the estimate.

A synopsis giving the estimated cost for each branch of work, and the plans are then submitted by the Supervising Architect to the three cabinet officers before mentioned for approval, after which no material change can be made without subsequent approval.

The general system of measuring and estimating for each trade will be given in future chapters with the specifications in detail.

After the plans and estimate are approved the working-drawings and specifications for each trade are prepared, the work advertised and the contract usually awarded to the lowest responsible bidder in the order in which a building is usually erected, excavating, foundations, stone and brick work, and so on. Sometimes when the building is small the contract is made for the entire work complete.

The law requires all work to be advertised, and the award of contracts is made by the Supervising Architect, after approval by the Secretary of the Treasury. Where the work would be delayed by advertising the Supervising Architect must declare that an emergency exists requiring the immediate performance of the work, when bids may be invited therefor by circular letters, or parties may be employed to do the work by the day, which action must also have the approval of the Secretary of the Treasury.

In the foregoing table the high rate per cubic foot for entire building at Chicago, Cincinnati and Philadelphia is because the stone was cut under the old fifteen per cent contracts, when it was to the interest of the contractor and his workmen to spend as much time as possible in cutting stone. The rate for the Hartford building is high for the same reason, and because of two large granite towers, and the unusual plan and arrangement of the building. The rate of the St. Louis building is high because of the fifteen per cent contracts for granite, and also because the building is surrounded by area walls about twenty-five feet high, built of red granite.

The rate per cubic foot for the Engraving and Printing Bureau at Washington is low because the building has few interior walls and very plain interior finish, the ceilings, except in a few rooms, being unplastered.

In the column under Heating Apparatus, the rate per cubis foot is for heated space, which will average about fifty-three per cent of the entire cubic contents of the building and does not exceed sixty per cent of entire cubic contents in any instance.

Jas. E. Blackwell.

[1] All interior walls and the backing of all exterior walls of superstructures are built of brick, the stone facing averaging 8″ and 12″ beds alternating. The backing of exterior basement walls are sometimes built of rubble stone when the cost does not exceed what brick would cost.

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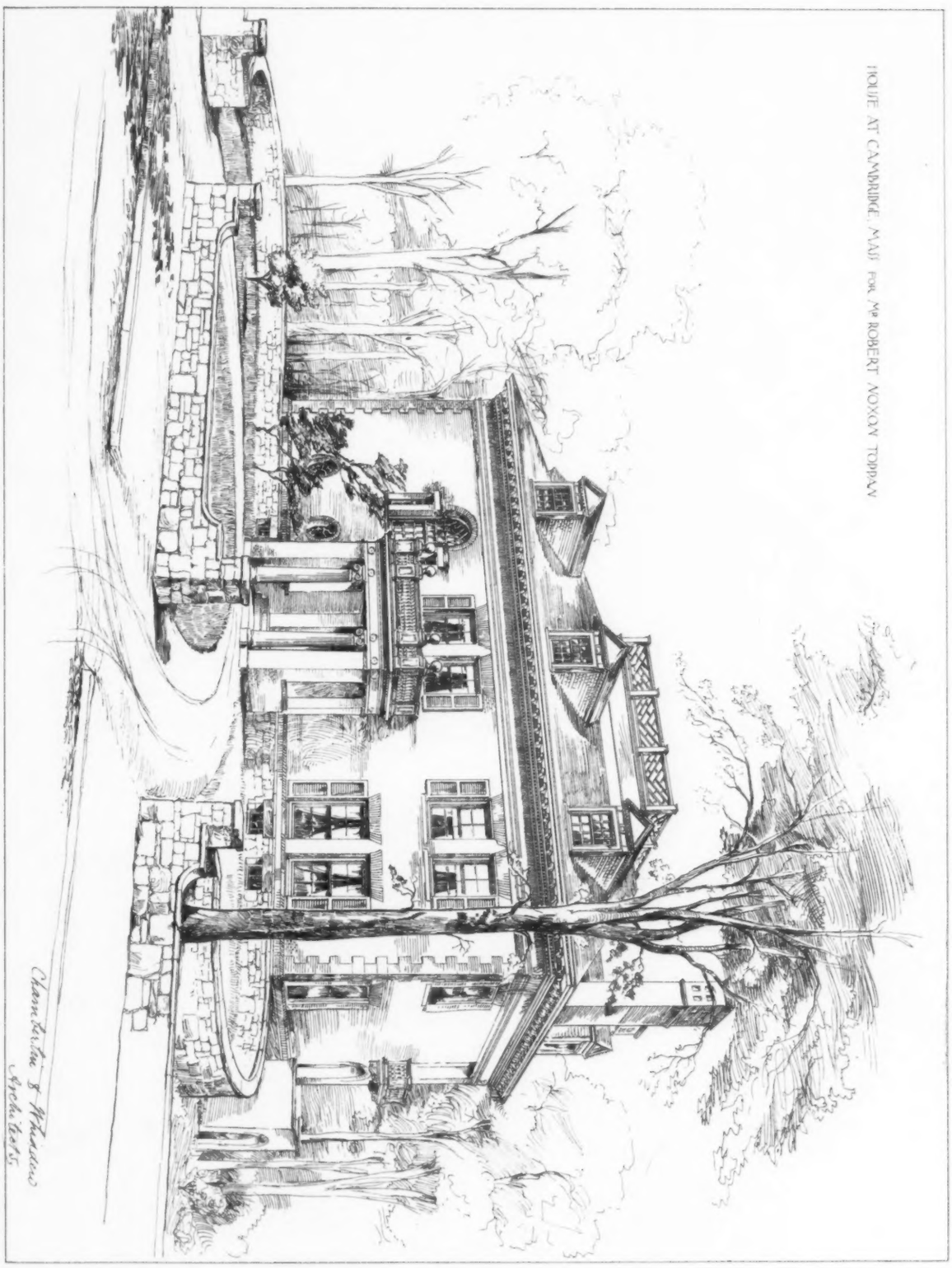

HOUSE AT CAMBRIDGE, MASS. FOR Mr ROBERT NOXON TOPPAN

Characteristic Architecture

Bellows Printing Co. Boston.

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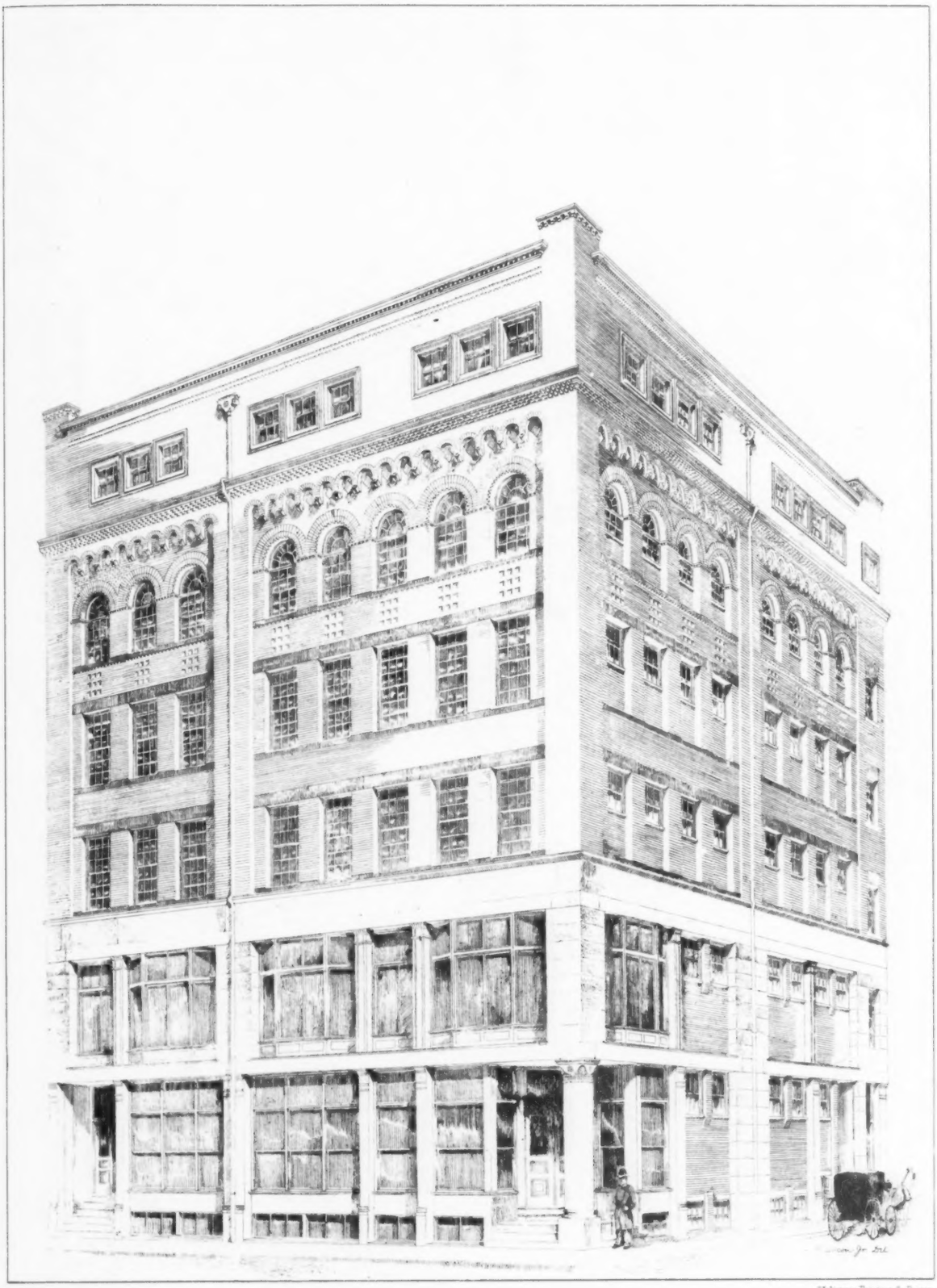

Heliotype Printing Co. Boston

STORES ON SOUTH STREET BOSTON, MASS. *Chamberlin and Whidden, Architects, 6 Beacon St. Boston.*

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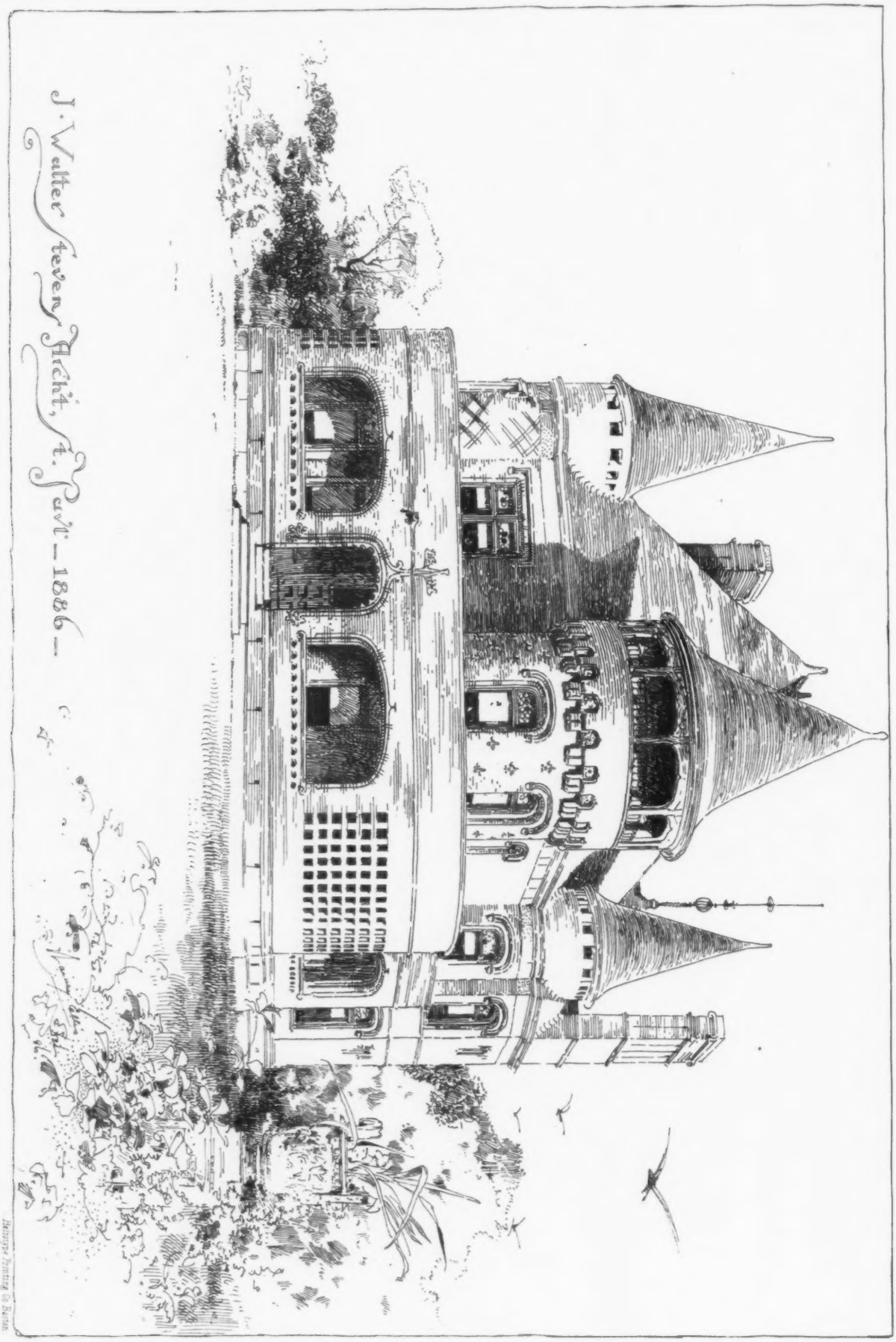

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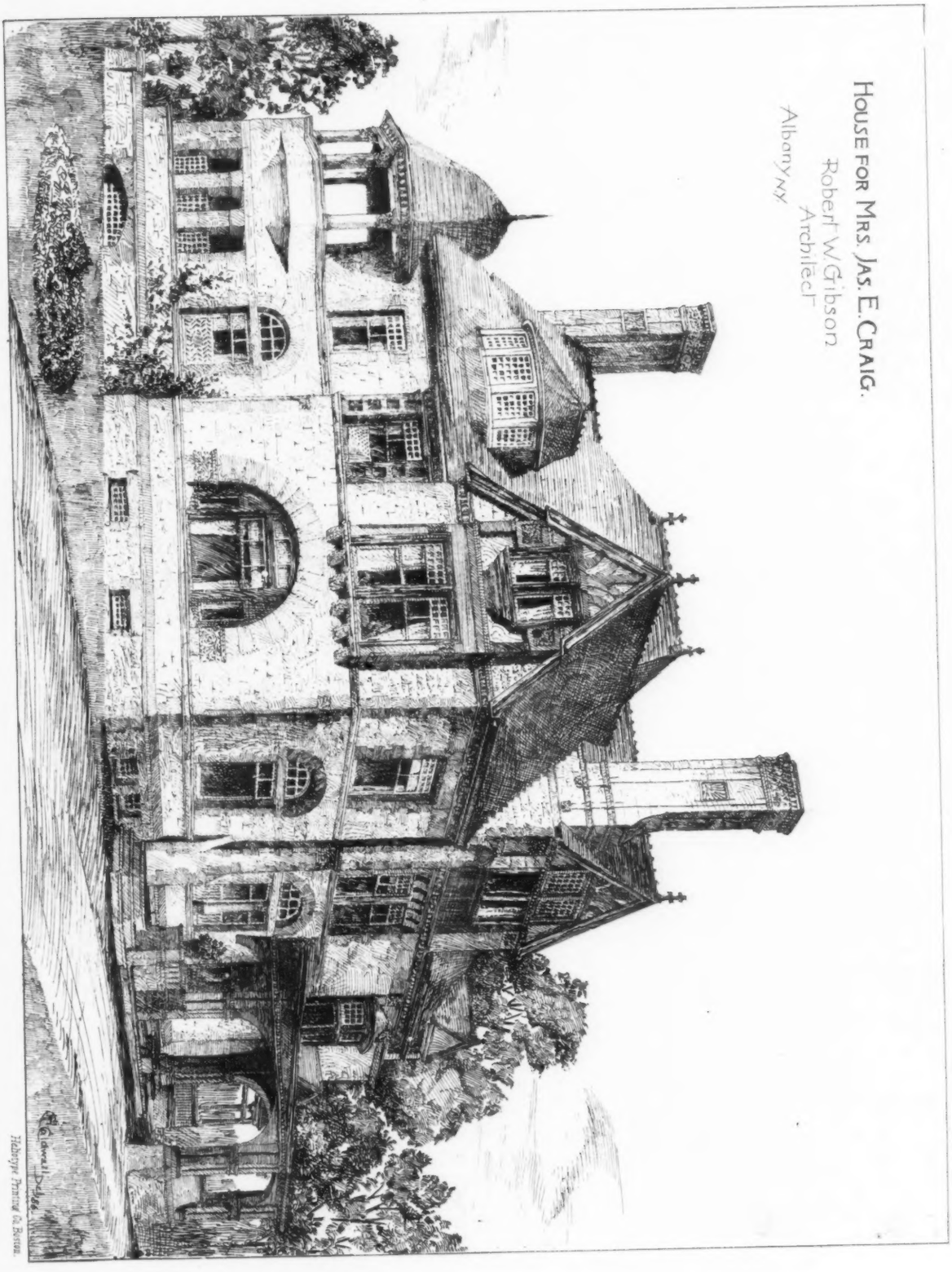

HOUSE FOR MRS. JAS. E. CRAIG.

Robert W. Gibson
Architect
Albany, N.Y.

Heliotype Printing Co. Boston.

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Heliotype Printing Co. Boston

Doorway of the Church of St. Vincent. Avila. Spain.

Designed by J. H. DUNN.

No. 550 AMERICAN ARCHITECT AND BUILDING NEWS, FEB. 5 1887.

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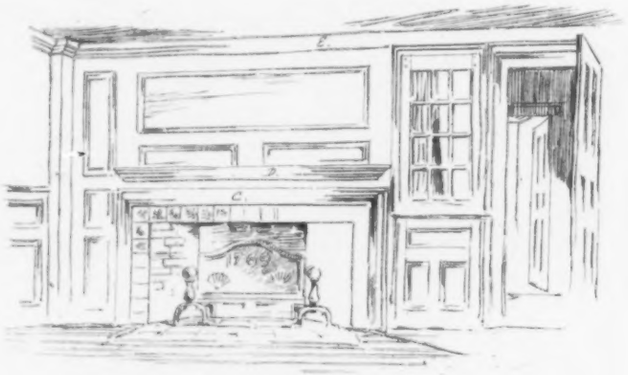
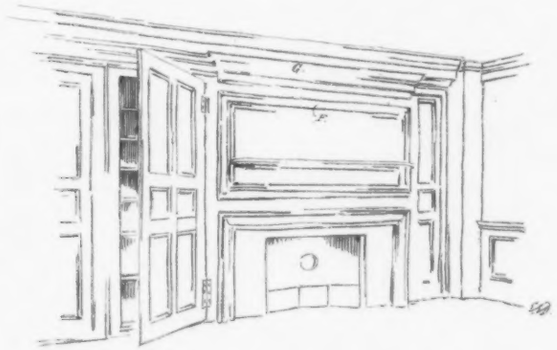
Cape Cod Sketches N°. 3.

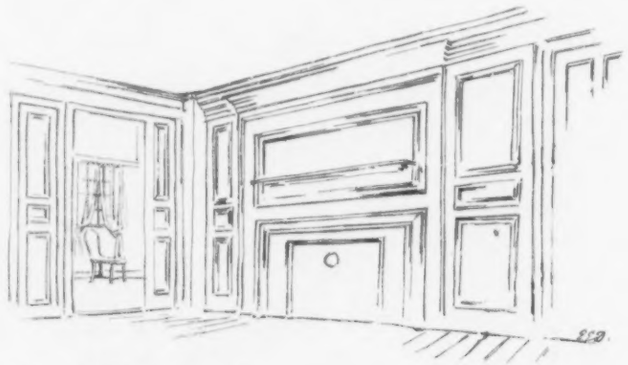
"A Group of old Fireplaces."



The Farmhouse at the Highland Light. North Truro.



The old Everett House. Wareham.



The old Everett House. Wareham.

Old House belonging to Mrs Hy. Thatcher. Yarmouth.

Heliotype Printing Co. Boston.

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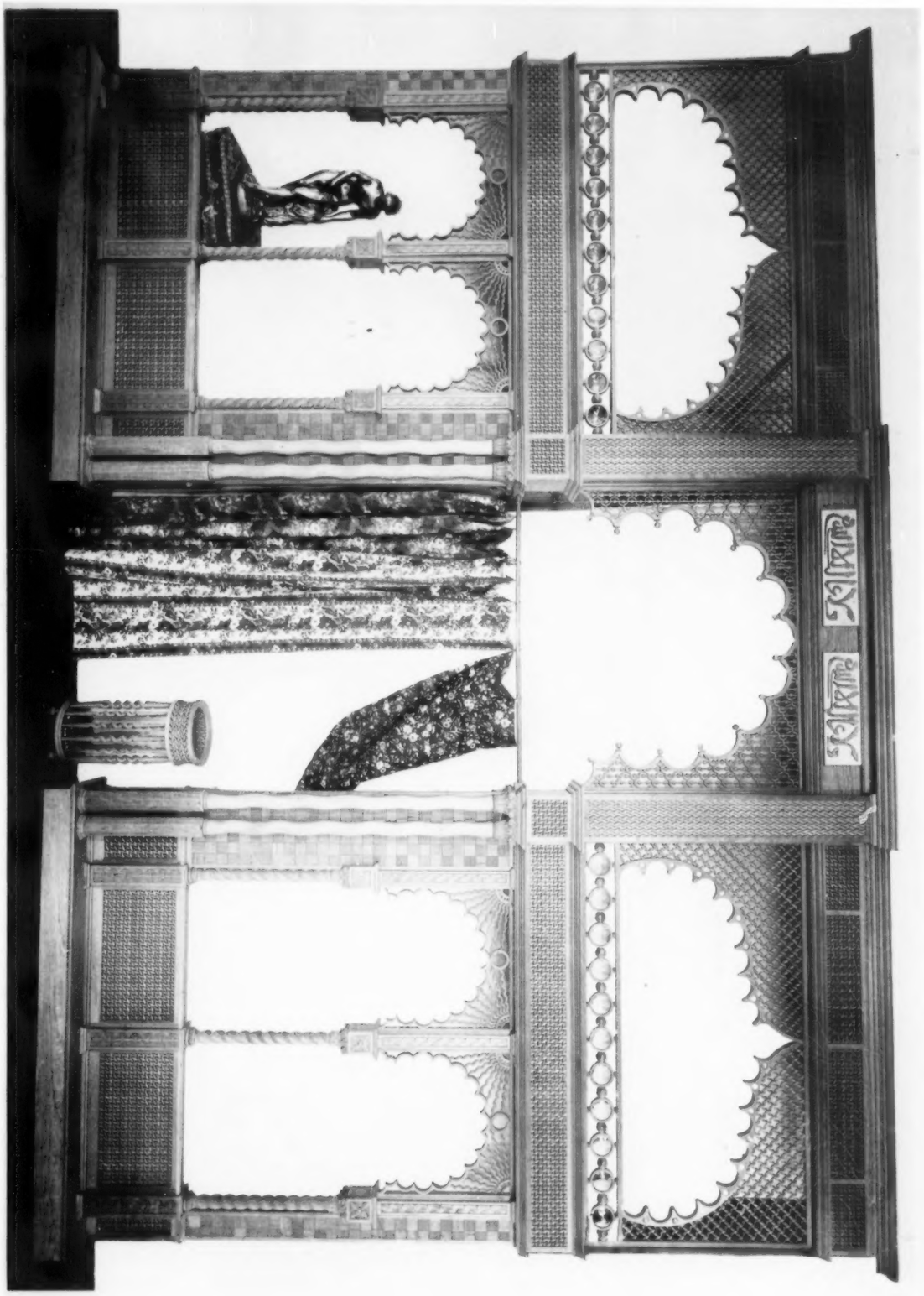


A SCREEN OF MOORISH FRET WORK.

Executed by C. S. RANSOM & Co., CLEVELAND, O.

Designed by J. H. DUNN.

HELIOTYPE PRINTING CO., BOSTON.

EXHIBIT OF ACTUAL COST AND CONSTRUCTION OF U. S. GOVERNMENT BUILDINGS.

Floors.	Roof.	Interior Finish.	Heating Apparatus.			
			Kind.	Cost.	Cubic feet of heated space.	Rate per cube foot.
Iron beams and brick arches	Iron, slate and copper	White oak, 2 iron stairs	Steam.	18,543.00	678,060	2.7
" " "	" " "	Butternut, 1 iron stair	H. W.	7,448.00	395,598	1.9
I-beams, brick and iron arching	Iron trusses, wood, slate and copper	Florida pine, 2 iron stairs	F'u'ce.			
1st floor, I-beams and brick arches; others wood	Wood and slate	Pine, 1 wood stair	H. W.	7,348.00	151,865	5.2
Iron beams and arches	Iron, slate and copper	Iron and mahogany, 2 iron stairs	H. W.	120,929.36	3,915,912	3.1
Iron beams and brick arches	" " "	" " " "	H. W.	139,648.75	4,158,057	3.4
" " "	Iron and slate	Oak, and 2 iron stairs	H. W.	31,848.00	660,646	4.8
1st and 2d floors, I-beams and arches; others wood	Wood, slate and copper	Butternut, 1 iron stair	H. W.	6,892,50	367,542	1.9
1st floor, I-beams and brick arches; others wood	" " "	White pine, 1 wood stair	H. W.	6,648.00	117,528	5.6
" " " "	" " "	Ash, and 1 wood stair	H. W.	1,548.00	66,856	2.3
I-beams and terra-cotta arches	" " "	Butternut, 1 iron stair	H. W.	6,888.00	241,604	2.9
1st and 2d floors, I-beams and brick arches; others wood	Wood, slate and asphalt	" " "	H. W.	11,900.00	313,080	3.8
Iron beams and brick arches	Wood, slate and copper	Pine and oak, 1 wood stair	H. W.	5,995.00	167,000	3.6
1st and 2d floors, I-beams and brick arches; attic, wood	Wood and slate	Butternut, and 1 wood stair	H. W.	6,448.00	243,467	2.6
Iron beams and arching	Iron, slate and copper	Oak, 2 iron stairs	H. W.	17,309.35	266,973	6.5
" "	" " "	Butternut, 1 iron stair	Steam.	10,638.35	380,683	2.8
Wood, joists and double floor	Wood and copper	Pine, and 1 wood stair	H. W.	6,464.00	142,000	4.5
" " "	Wood, slate and copper	" " "	H. W.	4,285.00	105,000	4.
Iron beams and arching	Iron, slate and copper	Pine and oak, 2 iron stairs	Steam.	15,735.00	368,984	4.3
" "	Wood, slate and copper	Ash, 1 iron stair	H. W.	6,548.00	248,961	2.6
" "	Iron, slate and copper	Cypress, 2 iron stairs	H. W.	8,848.00	288,874	3.
" "	" " "	Pine and cherry, 1 iron stair	H. W.	14,152.00	411,274	3.4
Wood joists	Wood, slate and tin	Pine, and 1 wood stair	Steam.	3,091.00	153,605	2.
Wood joists and double flooring	" " "	Pine, oak, and 1 wood stair	H. W.	7,848.00	254,770	3.1
Iron beams and arching	Iron, slate and copper	Pine and cherry, 2 iron stairs	H. W.	19,414.00	555,123	3.5
Wood joists	Wood, slate and tin	Pine, and 1 wood stair				
Iron beams and arching	Iron, slate and copper	White pine, 2 iron stairs	Steam.	6,448.00	130,146	4.9
1st floor, I-beams; others, oak joists	Wood, slate and copper	White pine, and 1 wood stair	H. W.	7,948.00	151,238	5.3
Iron beams and arching	" " "	White oak, 1 iron stair	H. W.	7,588.00	313,829	2.4
Iron beams and brick arching	Iron, slate and copper	Iron and mahogany, 2 iron stairs	Steam.	120,050.85	4,036,622	3.
Wood joists and double flooring	Wood, slate and copper	Pine, and 1 wood stair	Steam.	3,441.00	124,334	2.7
Iron beams and arching	" " "	Pine, 1 iron stair	H. W.	6,600.00	293,773	2.3
" "	Iron, slate and copper	Red wood and pine, 2 iron stairs				
Iron beams and brick arching	" " "	Iron and mahogony, 2 iron stairs	H. W.	156,047.36	3,012,856	5.2
" " "	" " "	Mahogany, 1 iron stair	Steam.	13,479.00	388,318	3.5
Iron beams and arching	" " "	Ash, 2 iron stairs	H. W.	6,988.00	323,971	2.2
" "	" " "	Oak, 1 iron stair	H. W.	13,448.00	341,375	3.9
" "	" " "	Pine, 1 iron stair	Steam.	19,173.50	1,080,446	1.8

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

READING-ROOM, MISSOURI SAFE-DEPOSIT COMPANY, EQUITABLE BUILDING, ST. LOUIS, MO. MESSRS. THAYER & ROBINSON, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial Edition.]

THIS room is one of a suite of offices in the basement of the Equitable Building as lately altered and fitted up for the business of a safe-deposit company. The conditions were exceedingly circumscribed, owing to the low story and constructive requirements in the substructure. The vaulted ceiling was introduced with a view to forming a unit of what were originally three independent offices where the dividing walls could be but partially removed. The wainscot is executed in oak, in five thicknesses, cross and counter veneered — the shafts of pilasters in arched openings being of St. Anne marble with capitals of bronze, while the mantel is of Boise d'Orient marble and tiling of Tennessee marble. The vaulted ceiling is of iron, plastered with decorations in distemper.

HOUSE OF R. N. TOPPAN, ESQ., CAMBRIDGE, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

THIS house is built of common brick laid in white mortar, with quoins of pressed brick laid in red mortar. The cornice and other wooden finish are painted white.

STORES ON SOUTH STREET, BOSTON, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

HOUSE FOR MRS. J. E. CRAIG, ALBANY, N. Y. MR. R. W. GIBSON, ARCHITECT, ALBANY, N. Y.

THE house was built on Englewood Place, in this city, and cost about $25,000.

HOUSE AT ST. PAUL, MINN. MR. J. W. STEVENS, ARCHITECT, ST. PAUL, MINN.

SIDE DOORWAY OF THE CHURCH OF SAN VINCENTE, AVILA, SPAIN.

CAPE COD SKETCHES NO. 3.

SAFE BUILDING.—XII.[1]

CHAPTER II.

FOUNDATIONS.

Nature of Soils. THE nature of the soils usually met with on building sites are: rock, gravel, sand, clay, loamy earth, "made" ground and marsh (soft wet soil).

If the soil is hard and *practically* non-compressible, it is a good foundation and needs no treatment; otherwise it must be carefully prepared to resist the weight to be superimposed.

Stepping Courses. The base-courses of all foundation walls must be spread (or stepped out) sufficiently to so distribute the weight that there may be no appreciable settlement (compression) in the soil.

Two important laws must be observed: —

1. All base-courses must be so proportioned as to produce exactly the same pressure per square inch on the soil under all parts of building where the soil is the same. Where in the same building we meet with different kinds of soils, the base-courses must be so proportioned as to produce the same relative pressure per square inch on the different soils, as will produce an equal settlement (compression) in each.

2. Whenever possible, the base-course should be so spread that its neutral axis will correspond with the neutral axis of the superimposed weight; otherwise there will be danger of the foundation walls settling unevenly and tipping the walls above, producing unsightly or even dangerous cracks.

Example.

In a church the gable wall is 1′ 6″ *thick, and is loaded (including weight of all walls, floors and roofs coming on same) at the rate of* 52 *lbs. per square inch. The small piers are* 12″ x 12″ *and* 7′ *high, and carry a floor space equal to* 12′ *x* 20′. *What should be the size of base-courses, it being assumed that the soil will safely stand a pressure of* 30 *lbs. per square inch?*

If we were to consider the wall only, we should have the total pressure on the soil per running inch of wall, $18.52 = 936$ lbs.

Dividing this by 30 lbs., the safe pressure, we should need $\frac{936}{30} = 31.2''$ or say 32″ width of foundation, or we should step out *each side* of foundation wall an amount $\frac{32-18}{2} = 7''$ each side.

Now the load on pier, assuming the floor at 100 lbs. per square foot, would be $12 \times 20 \times 100 = 24{,}000$ lbs. To this must be added

Continued from page 8, No. 375.

the weight of the pier itself. There are 7 cubic feet of brickwork (weighing 112 pounds per foot) = 7.112 = 784 lbs., or a total load of say 25,000 lbs. This is distributed over an average of 144 square inches; therefore pressure per square inch under pier

$$\frac{25000}{144} = 17.4 \text{ or, say, } 18 \text{ lbs.}$$

We must therefore make the foundation under gable wall still wider, in order to avoid unequal settlements. The pressure per running inch we found to be 936 lbs.; therefore the width required would be $= \frac{936}{18} = 52''$.

We therefore shall have to step out *each side* of foundation wall an amount $\frac{52-18}{2} = 17''$.

The safe compressions for different soils are given in Table V, but in most cases it is a matter for experienced judgment or else experiment.

Testing Soils. It is usual to bore holes at intervals, considerably deeper than the walls are intended to go, at some spot where no pressure is to take place, thus enabling the architect to judge somewhat of the nature of the soil. If this is not sufficient, he takes a crowbar, and, running it down, his experienced touch should be able to tell whether the soil is solid or not. If this is not sufficient, a small boring-machine should be obtained, and samples of the soil, at different points of the lot, bottled for every one or two feet in depth. These can be taken to the office and examined at leisure. The boring should be continued if possible, until hard bottom is struck.

If the ground is soft, new made, or easily compressible, experiment as follows: Level the ground off, and lay down four blocks each, say 3″ x 3″; on these lay a stout platform. Alongside of platform plant a stick, with top level of platform marked on same. Now pile weight onto platform gradually, and let same stand. As soon as platform begins to sink appreciably below the mark on stick, you have the practical ultimate resistance of the foundation; this divided by 36 gives the ultimate resistance of the foundation per square inch. One-tenth of this only should be considered as a safe load for a permanent building.

Drainage of Soil. Drainage is essential to make a building healthy, but can hardly be gone into in these articles. Sometimes it is also necessary to keep the foundations from being undermined.

It is usual to lead off all surface or spring water by means of blind drains, built underground with stone, gravel, loose tile, agricultural-tile, half-tile, etc. To keep dampness out, walls are cemented and then asphalted, both on the outsides. If the wall is of brick, the cementing can be omitted. **Damp-proofing.** Damp-courses of slate or asphalt are built into walls horizontally, to keep dampness from rising by capillary attraction. Cellar bottoms are concreted and then asphalted; where there is pressure of water from

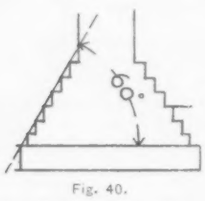


Fig. 40.

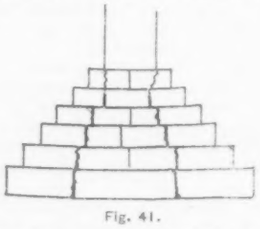


Fig. 41.

underneath, such as springs, tide-water, etc., the asphalt has to be sufficiently weighted down to resist same, either with brick paving or concrete.

Where there are water-courses they should be diverted from the foundations, but never dammed up. They can often be led into iron or other wells sunk for this purpose, and from there pumped into the building to be used to flush water-closets, or for manufacturing or other purposes. Clay, particularly in vertical or inclined layers, and sand are the foundations most dangerously affected by water as they are apt to be washed out.

Where a very wide base-course is required by the nature of the soil, it is usual to step out the wall above gradually; the angle of stepping should never be more acute than 60°, or, as shown in Figure 40. Care must also be taken that the stepped-out courses are sufficiently wide to project well in under each other and wall, to prevent same breaking through foundation, as indicated in Figure 41.

Where, on account of party lines or other buildings, the stepping out of a foundation wall has to be done entirely at one side, the stepping should be even steeper than 60°, if possible; and particular attention must be paid to anchoring the walls together as soon and as thoroughly as possible, in order to avoid all danger of the foundation wall tipping outwardly.

Where a front or other wall is composed of isolated piers, it is well to combine all their foundations into one, and to step the piers down for this purpose, as shown in Figure 42.

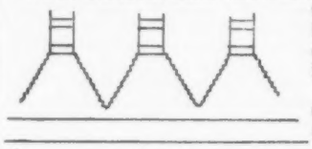


Fig. 42.

Where there is not sufficient depth for this purpose, inverted arches must be resorted to.

The manner of calculating the strength of inverted arches will be given under the article on arches. Inverted arches are not recommended, however (except where the foundation wall is **Inverted arches.** by necessity very shallow), as it requires great care and good mechanics to build them well.

Two things must particularly be looked out for: 1, That the end arch has sufficient pier or other abutment; otherwise it will throw the pier out, as indicated in Figure 43. (This will form part of calculation of strength of arch.) Where there is danger of this, ironwork should be resorted to, to tie back the last pier.

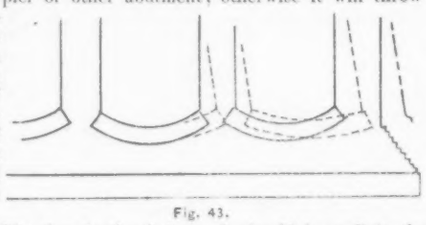


Fig. 43.

Size of Skew-back. 2. The skew-back of the arch should be sufficiently wide to take its proportionate share of load from the pier (that is, amount of the two skew-backs should be proportioned to balance of pier or centre part of pier, as the width of opening is to width of pier); otherwise the pier would be apt to crack and settle past arch, as shown in Figure 44.

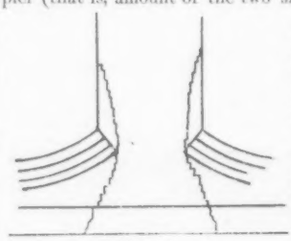


Fig. 44.

An easy way of getting the width of skew-back graphically is given below. In Figure 45, draw A B horizontally at springing-line of inverted arch; bisect A C at F, and C B at E. Draw E O at random to vertical through F; then draw O C, and parallel to O C draw G D; then is C D the required skew-back.[1]

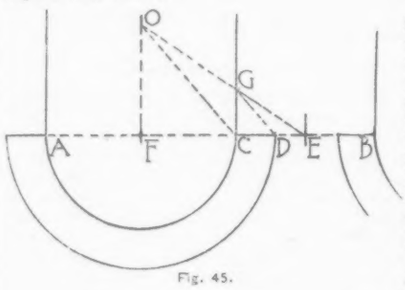


Fig. 45.

A good way to do is to give the arches wide skew-backs, and then to introduce a thick granite or blue-stone pier stone over them, as shown in Figure 46. This will force all down evenly and avoid cracks. The stone must be thick enough not to break at dotted lines, and should be carefully bedded.

[1] In reality C D should be somewhat larger than the amount thus obtained; but this can be overlooked, except in cases where the pier approaches in width the width of opening. In such cases, however, stepping can generally be resorted to in place of inverted arches. Then, too, if the opening were very wide and the line of pressure came very much outside of central third of C D, it might be necessary to still further increase the width of skew-back, C D.

GLOSSARY OF SYMBOLS.—The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.: —

a = *sq. a.* in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
= *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
$\mathfrak{D}$ = *diameter*, in inches.
$\mathfrak{r}$ = *radius*, in inches.
π = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{II}, a_{III}, a_{IIII}, etc., or b, b_{II}, b_{III}, b_{IIII}, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance: —

m = moment or bending moment at *centre*.
m_A = " " " *point A*.
m_B = " " " *point B*.
m_X = " " " *point X*.
s = strain at *centre*.
s_B = " *point B*.
s_X = " *point X*.
v = stress at *centre*.
v_D = " *point D*.
v_X = " *point X*.
w = load at *centre*.
w_A = " *point A*.

Example.

A foundation pier carrying 150000 lbs. is 5′ wide and 3′ broad. The inverted arches are each 24″ deep. What thickness should the granite block have?

We have here virtually a granite beam, 60″ long and 36″ broad, supported at two points (the centre lines of skew-backs) 36″ apart. The load is a uniform load of 150,000 lbs.

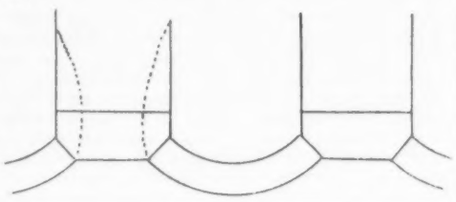


Fig. 46.

The safe modulus of rupture, according to Table V, for average granite is $\left(\frac{k}{f}\right) = 180$ lbs.

The bending moment on this beam, according to Formula (21) is

$$m = \frac{u.l}{8} = \frac{150\,000.36}{8} = 675\,000$$

The moment of resistance, r, is, from Formula (18)

$$r = \frac{m}{\left(\frac{k}{f}\right)} = \frac{675\,000}{180} = 3\,750$$

From Table I, No. 3, we find

$$r = \frac{bd^2}{6}, \text{ therefore}$$

$$\frac{bd^2}{6} = 3750 \text{ ; now, as } b = 36, \text{ transpose and we have}$$

$$d^2 = \frac{3750.6}{36} = 625.$$

Therefore $d = 25''$ or say 24″. The size of granite block would have to be 5′ x 3′ x 2′.

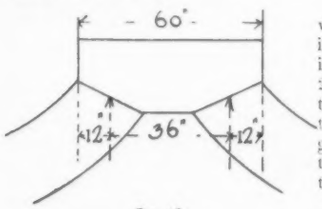


Fig. 47.

As this would be a very unwieldy block, it might be split in two lengthwise of pier; that is, two stones, each 5′ x 18″ x 2′ should be used, and clamped together. Before building piers, the arch should be allowed to get thoroughly set and hardened, to avoid any after shrinkage of the joints.

A parabolic arch is best. Next in order is a pointed arch, then a semi-circular, next elliptic, and poorest of all, a segmental arch, if it is very flat. But, as before mentioned, avoid inverted arches, if possible, on account of the difficulty of their proper execution.

Rock foundations. A rock foundation makes an excellent one, and needs little treatment, but is apt to be troublesome because of water. Remove all rotten rock and step off all slanting surfaces, to make level beds, filling all crevices with concrete, as shown in Figure 48:

In no case build a wall on a slanting foundation.

Look out for springs and water in rock foundations. Where soft

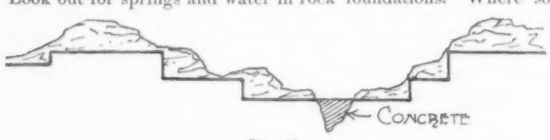


Fig. 48.

soils are met in connection with rock, try and dig down to solid rock, or, if this is impossible, on account of the nature of the case or expense, dig as deep as possible and put in as wide a concrete base-course as possible. If the bad spot is but a small one, arch over from rock to rock, as shown in Figure 49:

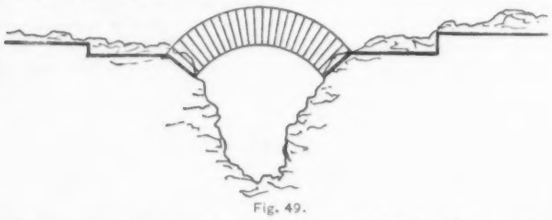


Fig. 49.

Sand, gravel and clay. Good hard sand or even quicksand makes an excellent foundation, if it can be kept from shifting and clear of water. To accomplish this purpose it is frequently "sheath-piled" each side of the base course.

Gravel and sand mixed make an excellent, if not the best foundation; it is practically incompressible, and the driest, most easily drained and healthiest soil to build on.

Clay is a good foundation, if in horizontal layers and of sufficient thickness to bear the superimposed weight. It is, however, a very treacherous material, and apt to swell and break up with water and frost. Clay in inclined or vertical layers cannot be trusted for important buildings, neither can loamy earth, made ground or marsh. If the base-course cannot be sufficiently spread to reduce the load to a minimum, pile-driving has to be resorted to. This is done in many

Short piles. different ways. If there is a layer of hard soil not far down, short piles are driven to reach down to same. These should be of sufficient diameter not to bend under their load; they should be calculated the same as columns. The tops should be well tied together and braced, to keep them from wobbling or spreading.

Example.

Georgia-pine piles of 16″ diameter are driven through a layer of soft soil 15′ deep, until they rest on hard bottom. What will each pile safely carry?

The pile evidently is a circular column 15′ long, of 16″ diameter, solid, and we should say with rounded ends, as, of course, its bearings cannot be perfect. From Formula (3) we find, then, that the pile will safely carry a load.

$$w = \frac{a.\left(\frac{c}{f}\right)}{1 + \frac{l^2.n}{\rho^2}}, \text{ now from Table I, Section No. 7, and fifth column, we have}$$

$$a = \frac{22}{7}.\,r^2 = \frac{22.8^2}{7} = 201.$$

From the same table we find, for Section No. 7, last column,

$$\rho^2 = \frac{r^2}{4} = \frac{8^2}{4} = 16.$$

From Table IV we find for Georgia pine, along fibres, $\left(\frac{c}{f}\right) = 750$.

And from Table II, for wood with rounded ends,

$n = 0{,}00067$, therefore:

$$w = \frac{201.750}{1 + \frac{180^2.0{,}00067}{16}} = \frac{150750}{2{,}357} = 63958,$$

or say 30 tons to each pile.

Sand piles. Sometimes large holes are bored to the hard soil and filled with sand, making "sand piles." This, of course, can only be done where the intermediate ground is sufficiently firm to keep the sand from escaping laterally. Sometimes holes are dug down and filled in with concrete, or brick piers are built down; or large iron cylinders are sunk down and the space inside of them driven full of piles, or else excavated and filled in with concrete or other masonry, or even sand, well soaked and packed. If filled with sand, there should first be a layer of concrete, to keep the sand from possibly escaping at the bottom.

Where no hard soil can be struck, piles are driven over a large area, and numerous enough to consolidate the ground; they should not be closer than two feet in the clear each way, or they will cut up the ground too much. The danger here is that they may press the ground out laterally, or cause it to rise where not weighted. Sometimes, by sheath-piling each side, the ground can be sufficiently compressed between the piles, thereby being kept from escaping laterally.

Long piles. But by far the most usual way of driving piles is where they resist the load by means of the friction of their sides against the ground. In such cases it is usual to drive experimental piles, to ascertain just how much the pile descends at the last blow of the hammer or ram; also the amount of fall and weight of ram, and then to compute the load the pile is capable of resisting: one-tenth of this might be considered safe.

The formula then is:—

$$w = \frac{r.f}{10.s} \qquad (44)$$

Where w = the safe load on each pile, in lbs.
" r = the weight of ram used, in lbs.
" f = the distance the ram falls, in inches.
" s = the set, in inches, or distance the pile is driven at the last blow.

Where there is the least doubt about the stability of the pile, use three-fourths w, and if the piles drive very unevenly, use only one-half w.

Some engineers prefer to assume a fixed rule for all piles. Professor Rankine allows 200 lbs. per square inch of area of head of pile. French engineers allow a pile to carry 50000 lbs., provided it does not sink perceptibly under a ram falling 4′ and weighing 1350 lbs., or does not sink half an inch under thirty blows. There are many other such rules, but the writer would recommend the use of the above formula, as it is based on each individual experiment, and is therefore manifestly safer.

Example.

An experimental pile is found to sink one-half inch under the last

blow of a ram weighing 1500 *lbs., and falling* 12′ *What will each pile safely carry?*

According to formula (44), the safe load w would be

$$w = \frac{r.f}{10.s}$$ we have,

$r = 1500$ lbs.

$f = 12.12 = 144''$, and

$s = \frac{1}{2}''$, therefore

$$w = \frac{1500.144}{10.\frac{1}{2}} = 43200 \text{ lbs.}$$

If several other piles should give about the same result, we would take the average of all, or else allow say 20 tons on each pile. If, however, some piles were found to sink considerably more than others, it would be better to allow but 10 tons or 15 tons, according to the amount of irregularity of the soil.

All cases of pile-driving require experience, judgment, and more or less experiment; in fact all foundations do.

All piles should be straight, solid timbers, free from projecting branches or large knots. They can be of hemlock, spruce or white pine, but preferably, of course, of yellow pine or oak.

There is danger, where they are near the seashore, of their being destroyed by worms. To guard against this, the bark is sometimes shrunken on; that is, the tree is girdled (the bark cut all around near the root) before the tree is felled, and the sap ceasing to flow, the bark shrinks on very tightly.

Others prefer piles without bark, and char the piles, coat them with asphalt, or fill the pores with creosote. Copper sheets are the best (and the most expensive) covering.

Piles should be of sufficient size not to break in driving, and should, as a rule, be about 30′ long, and say 15″ to 18″ diameter at the top. They should not be driven closer than about 2′ 6″ in the clear, or they will be apt to break the ground all up. The feet should be shod with wrought-iron shoes, pointed, and the heads protected with wrought-iron bands, to keep them from splitting under the blows of the ram.

Sheath-piling. In sheath-piling it is usual to take boards (hemlock, spruce, white pine, yellow pine or oak) from 2″ to 6″ thick. Guide-piles are driven and cross pieces bolted to the insides of them. The intermediate piles are then driven between the guide piles, making a solid wooden wall each side, from 2″ to 6″ thick. Sometimes the sheath-piles are tongued and grooved. The feet of the piles are cut to a point, so as to drive more easily. The tops are covered with wrought-iron caps, which slip over them and are removed after the piles are driven.

Iron piles. Piles are sometimes made of iron; cast-iron being preferable, as it will stand longer under water. Screw-piles are made of iron, with large, screw-shaped flanges attached to the foot, and they are screwed down into the ground like a gimlet.

Sheath-piling is sometimes made of cast-iron plates with vertical strengthening ribs.

Where piles are driven under water, great care must be taken that they are *entirely immersed*, and at all times so. They should be cut off to a uniform level, below the lowest low-water mark. If they are alternately wet and dry, they will soon be destroyed by decay.

Base-courses over piles. After the piles are cut to a level, tenons are often cut on their tops, and these are made to fit mortises in heavy wooden girders which go over them, and on which the superstructure rests. This is usual for docks, ferry-houses, etc. For other buildings we frequently see concrete packed between and over their tops; this, however, is a very bad practice, as the concrete surrounding the tops is apt to decay them. It is better to cover the piles with 3″ x 12″ or similar planks (well lag-screwed to piles, where it is necessary to steady the latter) and then to build the concrete base course on these planks.

Better yet, and the best method, is to get large-sized building-stones, with levelled beds, and to rest these directly on the piles. In this case care must be taken that piles come at least under each corner of the stone, or oftener, to keep it from tipping, and that the stone has a full bearing on each pile-head. On top of stone build the usual base-courses.

Piles should be as nearly uniform as possible (particularly in the case of short piles resting on hard ground), for otherwise their respective powers of resistance will vary very much.

Slip-joints. It is well to connect all very heavy parts of buildings (such as towers, chimneys, etc.) by vertical slip-joints with rest of building. The slip-joint should be carried through the foundation-walls and base-courses, as well as above.

Where there are very high chimneys or towers, or unbraced walls, the foundation must be spread sufficiently to overcome the leverage produced by wind. These points will be more fully explained in the chapter on "Walls and Piers."

Action of frost. All base-courses should be carried low enough to be below frost, which will penetrate from three to five feet deep in our latitudes. The reason of this is that the frost tends to swell or expand the ground (on account of its dampness) in all directions, and does it with so much force that it would be apt to lift the base-course bodily, causing cracks and possible failure above.

Louis DeCoppet Berg.

[To be continued.]

BOOKS AND PAPERS.

It is especially a Frenchman's gift to write a book which is agreeable, interesting, apparently instructive and eminently readable, but which, when one gets to the end of it, leaves an opportunity to the reader of wondering why what seemed so vivid and interesting as he read has not left more definite impressions on the mind. To write an unillustrated book about some of the little-known manners and customs of the Chinese in such a way as to make one feel that he is actually there and seeing with his own eyes the articles and actions described would be for any but a French writer far from an easy task; but here is a writer[1] who has contrived to interest us as much in the actions of two fishermen wading about in a bit of overflowed meadow catching frogs and minnows, as in the fact that in examining at a bookseller's a book *printed* in 1282 he discovered that the wear and tear of ages had been effaced in a way peculiarly typical of the patient children of the Son of Heaven. On holding up the leaves of the book to the light he discovered that the ravages of bookworms, vermicular not bipedal, had been repaired by insetting in the leaf, with such minute exactness that the work could not be detected, unless held against the light, microscopic squares and rounds of paper, brought to the proper tone with the rest of the page. In a single leaf forty-three of these microscopic patches were counted. Without being able to recall just how a Chinese book differs in appearance from the familiar Japanese pamphlet, the reader cannot but feel that he too sees the treasures that the two bibliophiles, one European, the other Asiatic, pore over with so much delight. One sample of multi-color printing excites our admiration as it did theirs, and suggests a manner of annotation that might be of value, say, to Shakesperian scholars. This book was printed in 1685, the time of greatest literary culture, and the body of the text is printed in black; notes extracted from authors dead at the time the book was printed are in blue, the mourning color of the Chinese; the comments of the emperor Kang-chi, in yellow, the dynastic color of his house, which still reigns; the notes of his teachers are in green, and the remarks of *literati*, still living at the time of publication, are in red. All these notes are so disposed on the page as to give an agreeable general effect, some for the purpose being even interwoven in the text, others are in the margin, and still more at the top of the page in reversal of our habit of placing foot-notes at the bottom. Yet, in spite of each page having to "go to press," as it were, six times, there was no indication of misregister on the part of the presumably simple mechanism employed to produce the impression. The question is sometimes raised as to how a Chinaman comports himself when, after having enjoyed the advantages of Western civilization, he returns to spend in the home of his ancestors the sufficient fortune he has by shrewd economy and industry secured from those outer barbarians. This may be answered, so far at least as those who are really wealthy are concerned, by surmising that they follow the example of one of our author's friends who, on his return, divided his large house into two parts, one furnished entirely in the native style, where in the library the Chinese books are piled one on top of the other, after the fashion of the land, where are kept his magnificent collections of china and Oriental bric-à-brac and his harem of Chinese wives, living mainly on the floor, eating with chop-sticks, and lighted by the smokey lantern at night. To this part of the house only Chinese guests are, as a rule, admitted. In the other part of the house velvet carpets, stuffed furniture, and hangings abound; the fine library of books in all European languages is arranged on bookshelves in what we consider the proper way; gas supplied by a portable machine lights the rooms, and, for aught we can say, a European female contingent may form a fair substitute for the almond-eyed beauties on the other side of the wall. But the returned disciple of Confucius shows his respect for the conservatism of his fellow countrymen by carefully excluding them from this side of his dwelling, and so avoids contaminating their morals and bringing about that revolution of modern progress that all good Chinamen dread.

Europeans have gathered together collections of the most varied and singular articles, and whether the object of their devotion is porcelain, pipes, stamps or bits, each is equally absorbed in his hobby, but we do not believe that the mania for collecting India ink has yet been transported to the Occident. In China it is not an uncommon hobby to ride, and the most curious fact about it is that the collector does not allow himself to test the quality of his treasures, each stick is still virginal and the most precious is that to which the greatest antiquity can be ascribed, for in this, as in all else, the cult of age is paramount. One habit which is said to be universal amongst the better class in China goes far to explain a matter which has at times excited our casual wonderment. What becomes of all the watches that are manufactured every year by the hundred thousand? An English mathematician has shown what may possibly become of all the pins, by comparing the number manufactured with the area of the earth's surface plus the floor area of upper stories, and satisfactorily demonstrating that one is more likely to find the proverbial needle in the hay-stack than a pin in a given spot. But watches are

[1] "*La Chine inconnue*," par Maurice Jametel, élève diplomé de l'ecole des langues Orientales mortes; Lauréat de l'Institut de France, etc. Paris, 1886. Libraire de l'Art. J. Rouam, éditeur; 3 francs.

treated with more respect than pins, and good ones such as the great factories now make will last for many years, and though a greater array hang in pawn-brokers' windows than formerly, a large number must find other resting places. Our author points to one good market for our watch-makers by declaring that the mandarins carry watches, not one, but invariably two, which, funnily enough, are both carried in the same pocket, or what serves for a pocket. It is easy to see that if only one per cent of a population of two hundred and fifty million souls carry watches five million time-pieces will be needed to enable a single generation to keep its appointments. The origin of this fashion is unfathomable; it is not display for no watch-chains or guards of any kind are worn.

If any of our readers come upon this little book they can find a couple of hours' entertainment within its covers, and a good deal of curious information.

WE believe that Professor Merriam has done a very judicious thing in issuing a "key"[1] to his book "*On the Mechanics of Materials*," and we hope it will find its way into the hands of all who have bought his book. It was a mistake, we think, not to give in the original book the answers to the problems suggested, for, granted that the book was mainly prepared for use as a text-book for use at Lehigh University and similar institutions, and that the pedagogic mind believes that a better mental training can be had by making the student rely absolutely on his own powers of reasoning, it should have been foreseen that so good a book would inevitably find its way into the hands of many who had not been trained in the mental gymnastics of the school and lecture-room, but who, being momently engaged on practical construction, would have forced on them the chances of committing errors through a false understanding of the explanations given, which would have been avoided if the opportunity had been afforded them of comparing the results of their own computations with "the answers in the book."

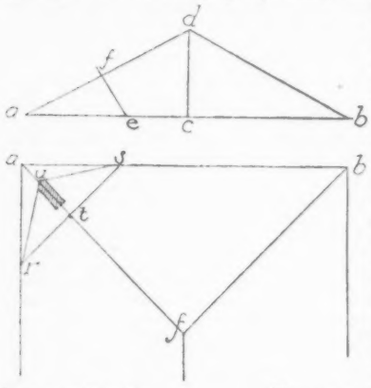
COMMUNICATIONS

TO FIND THE BEVEL OF A HIP-RAFTER.

CHARLESTOWN, MASS., January 22, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you or some of your readers have the kindness to answer the following query through the medium of your correspondence column, for the benefit of one who is in great need of a quick and simple way of performing such operations: —



How to find the angle of the hip when are given angles *a* and *d*? I wish for a rule that will be easy to apply. Our firm makes large quantities of "hip roll," and the architects always give us the pitches, and we have to find what the angle of hip is, ourselves, and the way we do it now costs a good deal, and takes considerable time, hence my inquiry.

Yours respectfully,

"ANXIOUS."

[A MOMENT'S reflection will show our correspondent that the correct form of his hip-rafter can be found only by a section made at right-angles with its length. When this is found, his riddle is answered. It requires only a slight imaginative effort to reduce the solution to graphical form. The upper cut represents the gable end of a roof, *a d* and *d b* indicating the hip-rafters. The lower cut represents a plan of one end of the roof, the same rafters being represented by *a f* and *b f*. If a plane is imagined to pass through the rafter *a d* at right-angles to its length, it will cut the roof at three points which it is easy to determine, one the point *f* at the top of the rafter, another the point *e*, where the perpendicular *f e* strikes the plate, and which is represented by *r* on plan, and the corresponding point on the other plate which is shown at *s* on plan. Imagine that this plane is hinged so that it can be folded down. It is plain that the point *f* will be found on plan at *u*, at a distance from *t* equal to the distance *e f*. If the point *u* is connected with *s* and *r*, the inclination of the slope of the roof is found, and by laying off on either side of *a f* half the thickness of the rafter, the proper right section of the rafter will also be shown on paper. — EDS. AMERICAN ARCHITECT.]

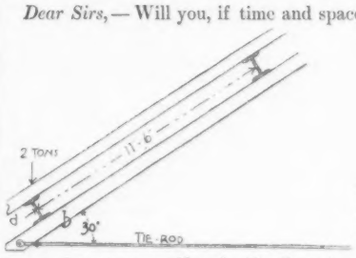
[1] "*Key to the Textbook on the Mechanics of Materials*," and of Beams, Columns and Shafts. By Mansfield Merriam, Professor of Civil Engineering in Lehigh University. New York: John Wiley & Sons; 1886.

THE PROPER POSITION OF AN IRON PURLIN.

CLEVELAND, O.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you, if time and space in your paper will allow, answer the following:



Let a roof-truss of say 80 feet span, of iron, have 12 feet between centre of principals, and slope of 30°, and let load on each apex be, say 2 tons, which will be equal to 2 tons uniformly distributed on each purlin, *a*. Now you will please decide: 1. Should the place of the web in I-beam *a* be vertical, or sinclined a shown? 2. If inclined, will not the weight of 2 tons act transversely in two directions (see small cut)? and if so, how should the weight be considered in computing section of purlin? An answer will oblige,

ONE OF YOUR READERS.

[THE web of the purlin should, in ordinary cases, lie in a plane normal to the inclination of the roof. If the jack-rafters abut on a plate at their foot, as they would naturally do, a vertical load upon them is decomposed at the purlin into two forces, one of which acts in a direction normal to the plane of the roof, and is therefore to be resisted by the purlin in the same way that a horizontal beam resists a vertical pressure; while the other component acts in the line of the jack-rafter, and is resisted finally by the plate at its foot. The proportion between these two components and the original vertical force is represented, as the diagram correctly shows by the sides of a triangle having one side vertical, the second parallel to the inclination of the roof, and the third normal to it. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

PAPER PIANO CASES. — Accounts are given in the German technical journals of some interesting experiments which have been made with success in the employment of paper in piano construction. The case is made entirely of paper, as a substitute for wood, the material being so compressed as to be susceptible of the high polish which is required for such instruments. As described, the color is a creamy-white; the tone is reported to be characterized by sweetness rather than loudness, the sound emitted, unlike the short broken note of the ordinary piano, being soft, full and slightly continuous, somewhat resembling that of the organ. This modification of tone, which must be considered an attractive feature, is attributed to the evenness of texture of the compressed paper. — *Lumber World.*

DURABILITY OF RAFT-TIMBER. — Raft-timber that has been floated down rivers has been ascertained to be no longer liable to the attack of dry-rot. So much so is this said to be the case that in Alsace it is customary to specify that only raft-timber shall be employed. The water slowly dissolves out the albumen and salts, and thus deprives the fungus of the nutriment needful for its development. A French investigator, we are told, has found by experiment that, whereas fresh sawdust when buried in damp earth rots away in a few years, sawdust which has been soaked for some time in water, and has been thereby deprived of soluble matters, will remain in the ground under similar circumstances wholly unchanged and only slightly tinged on the exterior with earthy matters dissolved from the soil. — *The Iron Age.*

THE STONE IMAGES ON EASTER ISLAND. — A strange memento of an unknown race is the gigantic stone image from Easter Island, now on the way to the Smithsonian Institution. This lonely isle in the Pacific is of volcanic origin, and is but eleven miles long and six broad, and, from its solitary situation, is seldom visited. The natives, but few in number, are of the Polynesian race, and were originally exceedingly hostile to the few whites who visited them. But within the past twenty-five years they have embraced Christianity under the influence of French missionaries. The island is owned by a Tahiti firm, who utilize its fertile valleys for cattle raising. The remarkable features which distinguish it from other solitary islands are the huge stone statues, to the number of several hundreds, which lie scattered about. They were chiselled with rude skill from the lava in the craters of extinct volcanoes, and transported to all parts of the island, where they were set up, but most of them have since been overthrown by earthquake shocks. Some of these statues are forty feet in height and some still remain unfinished in their quarries. Nothing is known of their origin. The present inhabitants possess neither the skill nor the tools for the work and have no appliances for transporting such immense masses of stone. Their traditions furnish no information, as they merely ascribe a supernatural origin. The statues are all grotesque effigies of human beings, and while they are low in the scale of art, they are evidently the work of a race centuries in advance of the present inhabitants. A theory has been advanced that Easter Island is the remnant of a submerged continent, and that the statues were made by a people who worshipped them as idols. But this is only theory without a particle of evidence to sustain it. The statue of the Smithsonian Institution is now on board the United States Steamer Mohican, which was, at last accounts, at Valparaiso. It weighs between twelve and fifteen tons, and it was with

great difficulty that it was placed on board the vessel, as the island has no good harbors, and although the image had to be transported overland about eight miles, there was not a tree to furnish the material. The Mohican finally obtained a few logs at Samoa, with which the work was accomplished. This is the second monster curio which has been taken away from Easter Island — a German vessel having secured one about two years ago. When it finds a permanent place here, our puzzled ethnologists may possibly be able to clear away the mystery of its origin by a careful study of its design and workmanship. — *Boston Transcript.*

Utilizing the Water from the Severn Tunnel. — At length an effort is being made to utilize the 14,000,000 gallons of water per day which the Great Western Railway Company are pumping at the Sudbrook Springs on the Monmouthshire side of the Severn Tunnel and at present allowing to run to waste, while it costs them nearly £10,000 a year to pump it into the Severn estuary. The water has been submitted to analysis, and has been declared to be the purest spring water, entirely free from organic matter, and the finest water that could be desired for domestic purposes. The mayor of Bristol presided over a town meeting in the Guildhall on Wednesday in favor of a scheme for using this spring as a further water-supply for Bristol by bringing it across the Severn by a tunnel beneath the bed of the river. It was stated that the company formed for this purpose consisted of influential Bristol citizens, and as a desire had been expressed that the corporation should have the control of the water-supply of the city, the bill which had been drafted contained a clause enabling the corporation to exercise all the powers of the act on payment of the cost and expense incident to obtaining it, and sums expended by the company in exercise of its powers, with five per cent interest. The capital was £480,000 in 48,000 shares of £10 each, with borrowing powers to the extent of £120,000. Mr. S. Will moved the resolution in favor of the scheme, which was unanimously carried, as was also one requesting the corporation to avail themselves of the provisions of the bill, and suggesting to them the desirability of reopening negotiations with the existing water company for the purchase of their undertaking by the city upon equitable terms. — *London Times.*

Excavations around the Great Sphinx. — The London *Times* publishes an interesting account of the disentombment of the great sphinx, which was commenced by Maspero about a year ago and since carried on by M. Grébaut. The work was undertaken in 1869, at the opening of the Suez canal, and the figure was cleared from sand as far as the paws, but the sand accumulated again up to the throat. The excavations executed during the past year have again brought to light the fore paws. To the right of the sphinx — that is to say, in the direction of the granite temple, to the southward — a further excavation is in progress, the result of which will probably confirm the surmises of those who believed the sphinx to stand in the midst of a huge artificial amphitheatre hewn out of the solid rock. This gigantic work would, of course, be contemporaneous with the sphinx itself, which Mariette attributed to the mythic ages before the advent of Mena, the first king of the first dynasty, and which Maspero considers to be, if not actually prehistoric, at all events the oldest monument in Egypt. From the level of the area below the great flight of steps (which lead down, and not up, to the sphinx), one now measures the whole height of the huge human-headed monster, whose battered countenance stands out against the cloudless sky one hundred feet above. The space between the paws is thirty-five feet long and ten feet wide. This space was anciently converted into a small sanctuary lined with votive tablets, only one of which — the famous stela of Thothmes IV — yet remains *in situ*. This stela records how the king, when upon one of his hunting expeditions, lay down to rest at midday in the shadow of the sphinx. He there fell asleep, and dreamed a dream in which the venerable image conjured him to clear away the sand in which it was nearly buried. Then the prince awoke and "made silence in his heart," and vowed to do that which the god had commanded. The lower part of this tablet is obliterated, and Mr. W. M. Flinders Petrie, who visited the spot about a fortnight ago, reports that an important part of the fourteenth line, containing the name of Khafra (Chephren), has scaled off since the last time the inscription was copied. The tablet stands fourteen feet high, and is cut from a block of the same red granite of Assouan whereof the neighboring Temple of Khafra is built. There seems, according to Mr. Petrie's report, to be very good reason for concluding that the pious Thothmes, notwithstanding his respect for the memory of Khafra, actually pilfered this very block from Khafra's own temple, for in the back of it there are two pivot holes, or, rather, "holes for letting in pivot blocks," precisely similar to the pivot holes which are to be seen in the lintel-stones and door-sills of that building. The granite altar between the paws is of the same syenite, and most probably came from the same convenient quarry. This last, however, is of Roman work, very roughly executed. The paws of the sphinx, as they now appear, are a restoration of Roman date, being cased in comparatively small slabs, and to some extent hollow underneath. The breast of the sphinx has likewise been faced with slabs, apparently in Roman times, and these slabs have again been repaired by cutting away the weathered surface and inserting a fresh facing. Like the legs of the Colossi of the plain, and those of the great statues of Aboo Simbel, the paws of the sphinx are covered with the Greek scrawls of early travellers, but these *graffiti* are mostly of a late period, and so slightly scratched that few are legible throughout. Such as they are, however, Professor Maspero has, it is understood, devoted himself to the ungrateful and difficult task of translating them. M. Grébaut's excavations are not limited to the clearance of the sphinx only. Various interesting tombs have lately been discovered in the vicinity of the great pyramid, and to the westward the face of the Libyan Cliff has been reached, where it forms the natural boundary of the pyramid plateau. Some good early rock-cut tombs, with built fore-courts, have been found in the face of this cliff, in two of which the walled-up recesses or secret chambers called "serdabs," which were conducted for the safe keeping of funerary portrait statues, are yet intact with their contents.

The Long Tunnel at Schemnitz. — An engineering work that has taken over a century to construct can hardly fail to offer some points of interest in its history, and illustrate the march of events during the years of its progress. An instance of this kind is to be found in a tunnel not long since completed, but which was commenced over a hundred years ago. This tunnel, or adit, as it should be more strictly termed, is at Schemnitz, in Hungary. Its construction was agreed upon in 1782, the object being to carry off the water from the Schemnitz mines to the lowest part of the Gran Valley. The work is now complete and, according to the *Bauzeitung für Ungarn*, it forms the longest tunnel in the world, being 10.27 miles long, or about one mile longer than St. Gothard, and 2½ miles longer than Mount Cenis. The height is 9 ft. 10 in. and the breadth 5 ft. 3 in. This tunnel, which has taken so long in making, has cost very nearly a million sterling, but the money appears to have been well spent; at least the present generation has no reason to grumble, for the saving from being able to do away with water-raising appliances amounts to 15,000*l.* a year. There is one further point, however, worth notice, for if we have the advantage of our great grandfathers, in the matter of mechanical appliances, they certainly were better off in the price of labor. The original contract for the tunnel, made in 1782, was that it should be completed in thirty years and should cost 7*l.* per yard run. For eleven years the work was done at this price, but the French Revolution enhanced the cost of labor and materials to such an extent that for thirty years little progress was made. For ten years following much progress was made and then the work dropped for twenty years more until the water threatened to drown the mines out altogether. Finally the tunnel was completed in 1878, the remaining part costing 22*l.* a yard, or more than three times as much as the original contract rates. — *Engineering.*

TRADE SURVEYS

During the past few days a multitude of newly-projected enterprises and extensive building-operations have come to light. Architects in New York, Philadelphia and Chicago, taking these cities as samples, have a much larger amount of business in hand at the opening of February than a year ago. Builders in those three cities have made contracts for extended building. Material-men have made contracts for supplies. Much work is to be done this month of a preparatory character. The higher range of prices during the past few months has strengthened the conservative industrial tendencies. Nothing will be undertaken but what has the promise of prompt returns stamped upon it. The only exception to this may be railroad-building. No doubt a moderate percentage of the 12,000 miles of road to be built this year will be caught in receivers hands in 1889 or 1890, but the community at large will be benefited in the meantime by the multiplied opportunities for the probable employment of labor and enterprise. The disappearance of eight hundred millions of capital into temporarily unremunerative channels will be offset by abundant chances to the great middle-class operators whose capitals run from $10,000 to $100,000. In fact, these little people, firms and companies will rapidly multiply in the next year or two by force of circumstances, and the immensely-rich corporations will find silken thread tied around them by the rising Lilliputian army. The monopolistic tendencies of a few years ago still exist, but the meat they feed upon is thinner. Corrective agencies more powerful than legislative wisdom can supply are at work opening the way for the new men who have taken their lesson in trade and manufacturing during the past ten years. This is made more and more evident by the failures of stock manipulators to control the markets in their selfish interests. Building operations this year will be similar in most respects to those of last year. A large amount of shop and mill building hangs on the outcome of trade developments of the next sixty days. If the distributing agencies are able to meet the expectations of the manufacturing interests during that time the latter will enter upon enlargements and improvements on an extensive scale. In a word, if the manufacturer, big and little, finds the markets will take all he is now offering them through jobbers and sale-agents they will enlarge; if not, not. But enough is already known upon the direct and indisputable authority of many of the architects and builders of high repute East and West, to say that the season will be a very active one in all directions. More frequent reference is made to the iron and steel interests than perhaps is necessary; but these interests are accessible and they very correctly reflect other interests and trades. A few plain facts will express more than the best opinions. A New York steel importer stated last week that he had contracted for the delivery of over 200,000 tons of foreign steel, and that the importations might, and probably would, reach 400,000 tons. There are at this time inquiries from railroad and other bridge-builders for some 25,000 tons of material, and during the week past contracts have been placed for 5,000 tons. Inquiries have also been made for 150 miles of gas-pipe, for large quantities of water-pipe and waterworks material. Railroad companies will place orders before April 1 for over 250 locomotive engines, and if all the facts were known this might, and probably would, prove to be a very small estimate. Just what the widely-scattered car-builders and the extremely reticent ship and boat builders have in sight must be for the present matters of guesswork. Prices at furnaces and mills are higher than a week ago. The lumber yards of the country are idle, but all lumber authorities unite in saying an early and active spring trade is assured, though very little is said about higher prices. The coal trade is active everywhere except where interrupted by strikes. Combinations on the eve of formation will regulate production in the interest of steady prices. All the great industrial interests are quietly awaiting the natural returns of trade, which it is generously agreed will be earlier than usual. Enterprise in the South continues to attract much capital, but the failures, few of which reach the public ear, are just sufficient to remind enthusiastic pioneers in new fields that there is always danger to be feared. The Northwest is opening up rapidly and is helped by the development of coal beds and the construction of railroad lines to lumber regions. Chicago land-operators and house-builders expect to make heavy investments this season to provide for the needs of emigrants who are seeking better opportunities in the far Northwest than are to be found in many of the worn-out agricultural localities of the States between the Mississippi and the Alleghenies. The population is redistributing itself because the 30,000 miles of railroad built during the past few years has made it possible for tens of thousands to sell out old homes and find better ones farther West and South. This depression is a factor not to be overlooked on arriving at a proper understanding of the changing industrial conditions.

The American Architect and Building News

ADVERTISERS' TRADE SUPPLEMENT.

No. 56. SATURDAY, FEBRUARY 5, 1887. VOLUME XXI. No. 580.

HOT-WATER HEATING.

We wish to draw the attention of architects, builders and others contemplating heating, to the advantages of warming dwellings, offices and public buildings by the Low-Temperature Hot-Water system. The subject of heating by hot-water is commanding great interest and attention on the part of sanitary and heating engineers in the United States and Canada, and also of private individuals contemplating the introduction of new heating-apparatus. This system is advancing so rapidly as to be on the eve of becoming the universal method of house-warming; and having made it a special study, and having conducted during many years extensive and costly experiments, we feel competent to present some remarks regarding this system, and we give assurance that if the principles and methods indicated by us be strictly adhered to, success must follow inevitably. It has been generally supposed that hot-water was more expensive to adopt than steam-heat, and involved more risk, but this is not so; for after an experience of ten years in setting up this class of apparatus, we have demonstrated that this system can be applied to a dwelling at no greater expense than steam-heat, *i. e.*, all things being equal, material, workmanship, and general durability of apparatus. The wear and tear of this apparatus will be far less than that of steam, as there is absolutely nothing that can wear out, while in a steam-apparatus there are various things which constantly require attention and repair.

We do not wish to convey the impression by the above remarks that steam is unfit for service, for in certain classes of buildings it is used to advantage, particularly where power is used and intermittent heat is required.

The disadvantages of the steam apparatus for house-heating are its great danger, the absolute necessity which exists for constant attendance and watchfulness, its want of permanence of temperature, and its increased cost of fuel above that of a hot-water apparatus.

In advance of a treatise on the subject of hot-water heating which we are about to issue to architects, steam-fitters and plumbers, we desire now to enumerate some of the advantages of this system over steam-heat for private dwellings, offices and public buildings, and respectfully ask the co-operation of the profession, and the steam-fitters and plumbers, to aid us in placing before the public this very desirable system of heating, and will be pleased to give them all necessary instruction regarding the setting-up of this class of apparatus. The following are some of the advantages of heating by hot-water: —

First.—Hot-water radiators will heat with a low-fire, while with steam radiators no heat is given off until steam is generated; the amount of fuel consumed in first raising steam being practically wasted, so far as heating the building is concerned.

Second. — With steam-apparatus, should the fire be neglected, and the temperature in the boiler fall below 212° Fahrenheit, steam radiators will cool instantly, although the fire may be burning and the fuel wasting; whereas hot-water radiators will continue to give out heat, not only as long as there is any fire under the heater, but after the fire is completely out, until the water in the apparatus becomes of the same temperature as the surrounding atmosphere. This requires several hours to accomplish.

Third. — The heat of hot-water radiators can be perfectly controlled and regulated by partly closing the supply-valve; whereas, with steam radiators the valves must be wide open or tightly closed, otherwise the radiators fill with water of condensation, and become inoperative and noisy. Thus hot-water radiators can be regulated to meet the requirements of the external temperature, while with steam radiators we must take all the heat they can give, or none at all.

Fourth. — With hot-water apparatus, some of the radiators may be run at their full capacity, while others may be partly or entirely shut off, without causing noise or in any way interfering with the perfect working of the apparatus.

Fifth. — There is no danger from explosion, as the apparatus is open to the atmosphere through the expansion tank.

Sixth.—A hot-water apparatus operates by gravitation only. No pressure being produced, the use of safety-valves, pressure-gauges and other safety appliances are entirely dispensed with. As there is no waste of water, the apparatus needs filling but once.

Seventh.—Consumption of fuel from fifteen to twenty-five per cent less than by any other mode of heating.

Eighth. — Equality of temperature throughout all parts of the building.

Ninth. — Simplicity of the apparatus; an ordinary domestic, either male or female, being competent to take charge of it.

Tenth. — Perfectly noiseless in operation, there being none of the snapping or gurgling noises so common with steam.

Eleventh. — Durability, the apparatus costing little or nothing for repairs. There being no pressure or strain upon it, there is no wear or tear.

Twelfth.—Healthfulness. Hot water is considered very healthy for dwellings, and it is well known that in houses where the fierce heat of hot-air furnace or steam is used, house plants will not thrive; but, in cases where hot water is introduced, the same variety of plants are grown successfully.

Quoting from an article by J. Drysdale, M. D., and J. W. Hayward, M. D., of England, published in "*The Health and Comfort in House-Building*," they say: "As a proof of the healthfulness of hot-water heat, we may notice that one of us, who has lived four years in a house heated by the hot-water system, is a general practitioner of medicine, which involves being frequently called out at all hours of the day and night; yet no increased liability to cold or delicacy of any kind has been observed. On the contrary, whereas, previously, when living in ordinary houses, he frequently suffered from bronchitis and quinsy, he has never had either disease since living in his present house; and a member of his family, who had previously to spend several winters in a warm climate, is now able to remain at home and go about in the open air all the year round. For prevention of disease, we hold such a house a most important auxiliary."

It will be seen by the foregoing remarks that this system of heating has advantages over other systems of heating, and if the work be properly constructed, the attention and expense of running will be reduced to a minimum. What we desire to do is to place the hot-water system before the public in its true light, and try in a manner to overcome prejudices existing against this class of apparatus, and which is in almost all cases attributable to poorly constructed apparatus and unskilled workmanship. During the last few months we have applied this system of heating to the following private residences and public buildings: —

A. W. Clapp, 104 Pearl Street, Boston; Geo. N. Spear, 275 Franklin Street, Boston; M. Frost, Winthrop; J. A. Morse, Natick; Ex-Senator Frank Bigelow, Natick; H. M. Parker, Medfield, Mass.; Union Bank, Providence, R. I.; Old Colony R. R. Station, Middleboro, Mass., W. Frank Hurd, architect, and all are giving good satisfaction, and can be referred to.

Architects and others are respectfully invited to call and see this system in operation at the Company's office, Franklin Street, Boston, where the Managing Director, John A. Fish, will be pleased to give all necessary information respecting this system.

GURNEY HOT-WATER HEATER CO.,
237 FRANKLIN STREET, BOSTON.

THE CHICAGO GAS-MACHINE.

In this machine the gas is made by gasoline. The generator is made of a galvanized-iron outside tank and an inner one of copper, with a fire-proof packing two inches thick between the two parts, the opening where the gasoline is put in being encased with a water-seal, thereby making the whole thing perfectly fire-proof and satisfactory to the insurance companies.

The most profitable size of generator to purchase is a sixty-five gallon one, so that a barrel of gasoline can be put in at almost any time, thereby emptying the barrel so it can be immediately returned, thereby saving the trouble of filling so often. The generators are usually set in a pit in the ground outside the building, where it is handy to roll up a barrel and fill.

In using these machines it is necessary to have a pressure upon the gas to force it through the pipes. This can be done with a blower, or the same end may be obtained by letting in city gas into the generator, instead of air, thus getting the pressure from the city gas-works. The city gas is taken into the generator after leaving the city meter, and passes through the generator, pipes and burners, becoming so much richer that a two-foot burner with the mixed gas gives as much light as can be had from a four or five foot burner with the ordinary city gas alone.

We find that using the generator in this manner (with city gas for a pressure and to mix with the machine gas), there is a saving of fifty per cent where city gas costs $1.50 per 1,000 feet, and of course where city gas costs more the percentage of saving will be greater. To use the generator without city gas, the blower must accompany the generator to complete the outfit; the blower furnishing the air which is made into gas by passing it through the generator. In this way a barrel of 50 gallons of gasoline will make 10,000 feet of illuminating gas, as good as can be made the other way, with city gas for a pressure; the difference between the two methods being simply that with the blower the gas costs less per thousand; with city gas as a pressure, you dispense with the expense of the blower, and your gas costs a little more.

The patent for this generator has just been allowed, so it can be seen that this generator is of recent invention, and we have had the benefit of looking over all the other generators and knowing their defects.

In all the generators heretofore made, there is a series of chambers or valves that require just so much gasoline put into each one — no more or less — thereby necessitating a great deal of care in filling the generators, to prevent flooding them. This objection we have completely overcome, as a barrel of gasoline can be put into our generator as easily and with as little care as is imaginable.

We are using these machines for lighting our new shops and for heating our soldering-irons, thus dispensing entirely with the use of charcoal, except for outdoor work (our fire in June, which totally burned us out, was caused by coals from charcoal used in our fire-pots), and we find that it is cheaper than charcoal, with charcoal at seven cents per bushel; cleaner, safer and more satisfactory in every way, and can honestly recommend it heartily to the favorable consideration of architects.

We will guarantee our machines to perform all we claim, and if they do not, on a thirty days' trial, they can be returned to us at our expense.

KNISELY & MILLER,
129 and 131 So. Clinton St., Chicago.

ADAMANTA PAINT.

We would like to call the attention of all architects and builders to the Adamanta Enamel Paint, of which an advertisement will be found in this issue.

We manufacture the paint from only the best materials; it has a body of elastic oil varnish, and for durability and finish we consider it superior to any other prepared paint on the market.

It is unaffected by weather, heat, or moisture, which makes it in itself invaluable in that it can be adopted for either outside or inside work, and when we add to this that its positively non-porous qualities make it of the highest value for the floors, walls, and ceilings of hospitals and asylums, its value must be at once apparent to every one.

It is of the highest value for seashore and watering-place cottages, as it withstands all exposure and action of the salt air, and does not peel off.

The covering power of this paint is another great point in its favor, as one gallon will cover nearly five hundred square feet of surface, and will give a finish equal to varnish work. One of the severest tests to which a paint can be applied is on a merchant vessel — being exposed as it is at all times to the action of the elements, and by the very nature of the business, constantly going from one extreme of temperature to another, a paint which will go through all these conditions and yet retain its finish must be valuable. All this and much more we claim for the Adamanta Paint, as a simple trial will show. What we say about it in regard to vessels is equally true in regard to brick buildings, iron bridges, tin roofs, brick areas, engines, boilers, steam-pipes, railroad cars, steamboats, and all classes of work exposed to the weather and extremes of heat and cold.

We make this paint in a variety of shades, mixed ready for use, in pint, quart, half gallon and gallon pails, with patent covers, two, three and four gallon buckets, five and ten gallon kegs, and half-barrels and barrels, so that it can be applied by any one who can handle a brush. Samples and quotations will be furnished upon application.

HENRY W. PEABODY & CO., Selling Agents.
17 Mason Building, Boston.

MAHOGANY AND CHERRY STAINS.

In introducing these stains in a dry powder form, we call attention to their superior advantages over the old-fashioned liquid stains.

(1) In freight you save the difference between fifteen pounds and three hundred pounds.

(2) No loss from leakage, or from freezing in transportation.

(3) No evaporation causing unevenness in shades.

(4) No expensive packages.

(5) The saving in the cost; the deepest shade being produced for fifty cents per gallon.

These colors dissolve freely in boiling water or in alcohol, and produce deep, rich shades. Their tinctorial strength allows of unlimited reductions, producing a variety of shades from lightest cherry to deepest shades of old mahogany, at a reasonable cost.

The color being transparent, none of the beauty of the grain of the wood is lost.

Mahogany Stain, No. 1, — soluble in water or alcohol, — is for deep, rich shades of mahogany and cherry. One-half pound to a gallon of water or alcohol produces a deeper and richer shade than the best liquid stain now in the market.

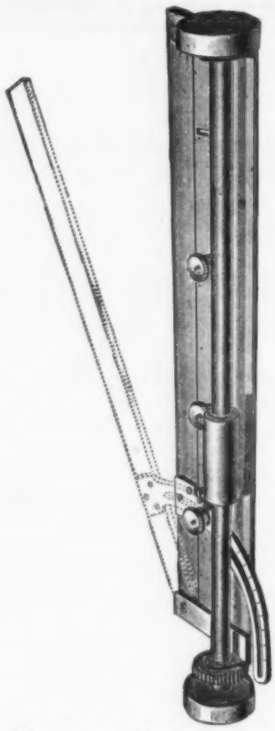
Mahogany Stain, No. 2, — soluble in alcohol only, — is for deep shade of antique mahogany, much darker than No. 1. Is extensively used on fine work, especially mahogany.

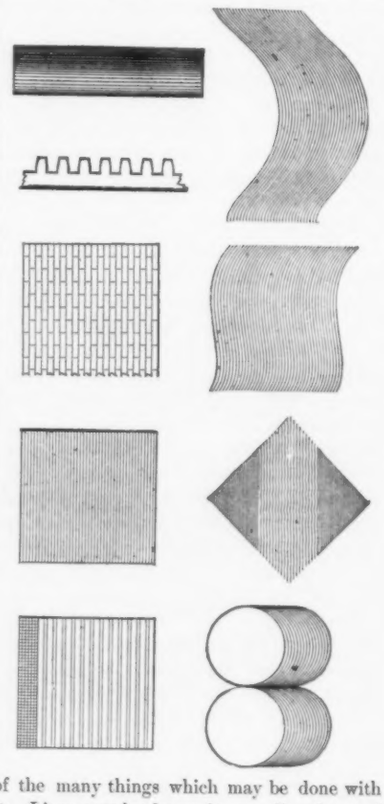
Sample bottles of the above, containing sufficient color to make one-half pint of stain, sent by mail on receipt of 25 cents.

WALPOLE DYE & CHEMICAL WORKS,
Henry D. Dupee, *Proprietor*,
44 & 46 Oliver St., Boston, U. S. A.

THE "UNIVERSAL" RULER AND SECTION LINER.

This ruler combines the following advantages: it is accurate, neat, simple, and durable, being made of steel and brass-nickel plated. The cuts on this page were drawn with this ruler and illustrate a few of the many things which may be done with it. Lines may be drawn in any direction and





at any distance apart, from one one-hundredth of an inch to any distance desired.

This instrument may be used without the spacing device, for parallel ruling, shading-cylinders, etc., by simply turning the screw near the ratchet towards the right.

FROST & ADAMS,
37 CORNHILL, BOSTON.

NOTES.

THE death of John Roach, who was President of the Chalmers-Spence Company, of New York, well-known manufacturers of Asbestos goods of all kinds, left a vacancy, which was filled by the trustees of the Company, on the 24th inst., by the advancement of Robert H. Martin, the former Secretary and Business Manager. Mr. George E. Weed still holds the position of Treasurer, while Mr. Van Nostrand, the former efficient and agreeable managing clerk, has been made Secretary of the Company. The business of this Company is steadily on the increase.

NEW YORK, January 1, 1887.

The co-partnership heretofore existing between the undersigned under the firm name of D. Rosenberg & Sons, has this day expired by limitation.

Herman Rosenberg,
Theodore Rosenberg,
Max Wolf,
Julius Rosenberg,
Oscar Rosenberg.

Referring to the above, we have this day incorporated under the name of Standard Varnish Works, D. Rosenberg & Sons, in accordance with the laws of the State of New York, and have purchased the stock, good will, etc., of the old firm of D. Rosenberg & Sons.

Hoping to be favored with a liberal share of your esteemed patronage, we remain,

Yours truly,
STANDARD VARNISH WORKS, D. ROSENBERG & SONS.

Stock Holders and Directors. { Herman Rosenberg, Theodore Rosenberg, Max Wolf, Julius Rosenberg, Oscar Rosenberg.

Officers. { Herman Rosenberg, Pres't. Theodore Rosenberg, V. Pres't. Max Wolf, Sec'y and Treas.

THE Wainwright Manufacturing Company, 65 and 67 Oliver Street, Boston, Mass., with agencies with F. B. Aspinwall, 93 Liberty Street, New York; Fairbanks & Co., 701 Arch Street, Philadelphia, and 302 Wood Street, Pittsburgh, Pa., report the following sales of their Feed-Water Heaters during the month of January:—

Four to New York City; two to Brooklyn; one to Tuckahoe, N. Y.; two to Swissvale, Pa.; one to Pittsburgh; one to Boston, one to Woburn and one to Leominster, Mass.; one to Keene, N. H.; and one to Saco, Me.; making total horse-power from 1,500 to 1,600. They have also made large shipments of their Corrugated Expansion Joints, and are erecting a purifying plant in the new premises of the Union Switch & Signal Co., at Swissvale, Pa.

They send us the following figures showing the great increase of sales from November, 1885, to January, 1887, in their Feed-Water Heaters. We think this testifies most clearly as to the efficiency of their Heaters:—

From November, 1885 to May, 1886, six months, 997 horse-power sold; from May, 1886, to September, 1886, four months, 3,893 horse-power sold; from September, 1886, to January, 1887, four months, 4,462 horse-power.

THE Cincinnati (O.) Corrugating Co. have for years used as their brand the word "Superior," and claim they bend every energy to the maintenance of the verity of their brand.

This is done by the closest attention to the minutest details—every sheet of iron being carefully inspected before painting, when even the smallest "pin-hole" compels rejection; by using the most-improved machinery, all driven by steam-power; by using none but the best metallic paint, thoroughly reground in pure linseed oil: by carrying the largest stocks of sheet-iron in the United States, thus filling all orders promptly, by furnishing inquirers at once with detailed estimates.

THE Chicago branch office of Messrs. Merchant & Company has been transferred from 182 East Kinzie Street to 202 Lake Street. Extension of business has made this change necessary. Mr. T. Le Nuray, who has been for three years the New York manager of Messrs. Merchant & Co., has left for London (England) where he will be permanently located conducting the office that this firm has opened there.

READERS of the *American Architect* are directed to an article by Mr. Asahel Wheeler in a number of the supplement under date December 4, wherein the printer, by a typographical error misapplies the proper term, using the word "massive" for "marine" varnish, as intended; but recently our attention was called to it, and desiring to do justice to all we cheerfully make the correction even at this late date.

THE new house and stables built at Newport for Miss Jones, of Philadelphia, by Peabody & Stearns are stained with Dexter Brothers' English Shingle Stain.

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Winckelmann's History of Ancient Art.

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A new and cheaper edition of this unique classic with 75 fine copper-plate engravings. Winckelmann has been translated into five languages, as the most important work on ancient æsthetics, and the copious annotations of various German, Italian, and English critics are attached to the new Boston edition. The fine arts of ancient Greece and Italy are described with luminous precision, and with a multitude of details of fascinating interest.

"Winckelmann's style resembles an ancient work of art. Each thought steps forth, fashioned in all its parts, and stands there, noble, simple, lofty, complete: IT IS."—*Herder.*

Ticknor & CO., 211 Tremont St., Boston, Mass.

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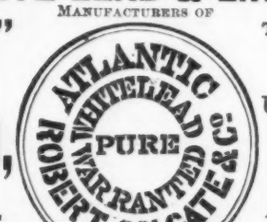

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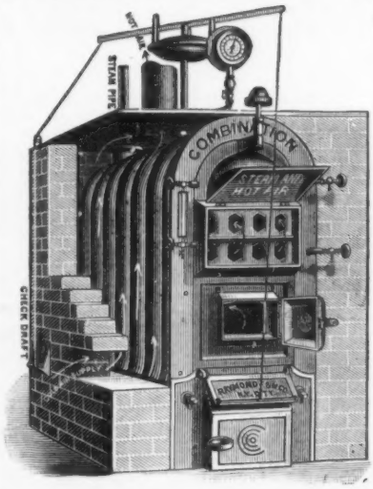

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The Raymond Furnace & Mfg. Co.
76 BEEKMAN STREET, NEW YORK.

The American Architect and Building News for 1887.

A PRELIMINARY PROSPECTUS.

It is not desirable for a journal which tries to place before its subscribers fresh and seasonable reading-matter to present a too-complete syllabus of the discourses which the editors propose to bring before them during the coming year, therefore, we will say only that we have in preparation the following series of valuable papers:—

"**Building Accidents.**" a series of papers treating of every class of accident that may befall a building, each class being considered by that writer whose opinion on the subject we consider likely to be most valuable. As our arrangements are not yet perfected we are unwilling to publish the, at present, incomplete list of contributors.

"**How the Conventional House may be made Picturesque.**" a series of illustrated papers by Mr. H. Edwards-Ficken, architect. Those who are familiar with this gentleman's decorative work and with the facility with which he can interpret in line his ingenious conceptions will understand that these papers will have more than a "popular" value.

"**Elevators: the Features common to all Makes and their Relation to Planning and Construction,**" a series of illustrated papers by an expert.

"**Hints to Builders,**" a series of practical papers on construction addressed to students by W. H. Brown, author of the "*Arch, Vault and Dome*," "*History and Principles of Decorative Art*," "*Buhl Work*," etc.

"**The Water-supply of Buildings,**" an illustrated series of articles by John Pickering Putnam, architect. The publication of this series, which was included in the programme for last year, we have found it desirable to postpone until now.

Fine Art Exhibitions. Mrs. Schuyler Van Rensselaer will, as she has done during the past ten years, keep our readers informed as to what artists and amateurs of art find of most interest in the galleries and elsewhere. Amongst the earliest papers from her pen will be some notes on the "**Works of Augustus St. Gaudens, sculptor.**"

Other articles on the "**History of Decoration**," on "**Cement and Iron in Construction,**" on "**Railroad Stations,**" etc., are also in preparation.

The following series of papers, the value of which has been shown by the portions already published will be continued through the greater part of the year:—

"**Architect, Builder and Owner before the Law,**" by T. M. Clark, architect.

"**Safe Building,**" by Louis De Coppet Berg, architect.

"**Early Settler Memorials.**" by Truman H. Bartlett, sculptor.

"**Ancient and Modern Light-houses.**" by Major D. P. Heap, Secretary of the U. S. Light-house Board.

The manner in which topics of current interest will be treated should be too well-known by this time to require description.

ILLUSTRATIONS.

"**Gelatine Prints.**"—In the "Imperial Edition" the number, quality and character of these attractive plates will not fall below the standard of those already issued.

Rotch Travelling Student Sketches.—The mass of these sketches in our hands shows that these plates—which add so greatly to the value of the Imperial edition—will be no less interesting in the future than they have been in the past.

Old Colonial Work.—Measured drawings of Old Colonial work in Virginia and Maryland will be furnished, with descriptive text, by Mr. Glenn Brown, architect.

Etchings.—The photo-lithographic reproduction of choice architectural etchings will be continued at regular intervals.

Photo-Caustic reproductions of foreign architectural subjects will receive rather more attention than during 1886.

Contributed Illustrations will be as varied and interesting as circumstances permit.